THE AMERICAN

GAS LIGHT JOURNAL

INC.

PUBLISHED WEEKLY, AT 42 PINE ST.

VOLUME CII. No. 1.
Whole No. 2,065.

NEW YORK, MONDAY, JANUARY 4, 1915.

Subscription, $3 Per Year.
$4 Canada, $5 Foreign.

LIBRARY OF CONGRESS
JAN 4 1915
SMITHSONIAN DEPOSIT

Riter-Conley Manufacturing Company

STEEL CONSTRUCTION

Pittsburgh

INDEX TO CONTENTS, PAGE 16.

ADVERTISERS' INDEX, PAGE 26.

THE UNITED GAS IMPROVEMENT COMPANY,

PHILADELPHIA.

BUILDERS OF

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

ACCURATE MEASUREMENT

OF

AIR AND STEAM SUPPLY

(PATENTED),

AFFORDING { PERFECT CONTROL OF GENERATOR FIRE CONDITIONS.

PRODUCING { UNIFORM RESULTS. HIGHEST EFFICIENCIES.

THE AMERICAN
GAS LIGHT JOURNAL
INC.

VOL CII., No. 1. NEW YORK, JANUARY 4, 1915. WHOLE No. 2,065.

WRITING TECHNICAL ARTICLES.

By Mr. H. Thurston Owens.

Write—Young Man—Write! This injunction is quite as appropriate for the young man in an Engineering profession to-day as were the words of Horace Greeley when he told the young men of the last generation, "Go West—Young Man—Go West."

Writing is a form of application that brings into play observation, analysis and concentration. It produces something which may or may not be of value to others; but it will always be of value to you, because a more or less hazy array of facts has been marshalled into orderly form, and writing about them has been an unconscious aid to your memory. If this were not so, Correspondence methods of instruction would have little claim for attention.

As an incentive to write, describe something which you believe would be of interest to those in your line of work in other localities. Send a description to a publication that will reach the people to whom the facts would be of interest or value and you will be repaid for your efforts. Incidentally you will receive payment for your work, but this consideration should be secondary as otherwise the more important benefits will not be yours. When your company completes some important or complicated construction work, a good subject is available. A new Show Room will have features of interest if its plan and arrangement as well as its decoration and contents represent good planning and intelligent installation.

Technical publications receives several times as many contributions as can be used, and selection depends upon the news value, the technical value and the literary value. The first two should be carefully weighed and the result will depend upon your observation and knowledge. The third will be affected as much by your application as by genius. In making a selection pick out something which contains a new idea or a new application. Later you can write on something of general interest, where language and style play a more important part in determining the value of articles for publication.

How to Write.—Having selected a topic, the order and arrangement will be best if you follow the simple advice which Mr. H. K. Landis, editor of "Gas Age," gave the writer a number of years ago: "Tell WHAT the thing is you are describing; HOW the work is done, and WHY it is done that way. What, how and why." This means that you should describe fully the article or appliance, the conditions surrounding its use, then how the operation is performed, and lastly why it is done that way, and the results.

Be Brief.—How often one hears this command, and how little it is heeded.

The third requirement is neatness. While we know that the artistic temperament claims immunity from such mundane regulations, they will not be overlooked by editors of high class publications. Write on one side of your paper only. This applies as well to all kinds of business writing. Leave plenty of white space on each side of your composition. Number your sheets or pages. Have all the sheets the same size, If illustrations are to be used, give each one a serial number and write a suitable description on the back of it. Make suitable references to each cut in the text, giving the figure number. Don't start a sentence with a proper name or end with figures. The former is poor style; the latter does not look well in type.

Eugenics and simplified spelling have a common ground in that they are practical. They both lose from lack of sentiment, and this brings us back to the human side of literature. The way a word is spelled has much the same effect as the way a person is dressed. This has to do with the psycology of writing and probably the most potent factor of this phase of the subject is that we unconsciously associate the spelling of words with our earliest knowledge of them, and the modern practical methods jar on our sensibilities. If you spell the old-fashioned way you will always be right, if you use the simplified method you will sometimes be wrong.

"Style" can only be acquired, and one of the elements of this elusive though valuable asset is not to use positive expressions unless they are complete and explanatory. The late Mr. Thomas J. Cunningham, editor of the American Gas Light Journal and for 2 years the writers "Chief," was most positive in his personal life, but his admonitions to qualify statements were numerous and are well remembered. Qualifications strengthen rather than weaken a statement, and do not leave the author open to charges of misconstruction, or to ridicule. Call a spade a spade; but call it a long one or a short one, or a sharp or a dull one. Compare it with another grave digger, and be assured that it will not be used for your interment.

Authorities.—Every subject that can be written about has been written about before, and you can use the thoughts of others to advantage by quoting them. Technical data is stronger when the authority is given. When quoting use only such portions of the reference as are necessary to prove your point, and then always give a foot note with volume and page number of the publication in which it appears.

Never quote without giving credit, which in plain terms means "Thou shalt not steal." It is unfortunately true that this biblical command has been less strictly adhered to by editors than by lay writers.

When using quotations from standard authors a reference would be a reflection upon your readers intelligence. They had better be left in ignorance than have their feelings hurt. When quoting from technical authorities, however, sentiment is not an excuse for omitting to give credit.

The Name.—The title of an article should indicate clearly its contents, and to do this surely it is good practice to write the article first and name it afterwards.

If the article is long enough to warrant it should be divided into logical sections, and each section should have a sub-head or section title.

Writing Papers for Associations.—In writing a paper for presentation to an association an entirely different view point must be your basis, compared with an article for a trade publication. News value and style are not so important. You should bring a message and present it in a logical manner and, if possible, prove your argument. Papers which carry some constructive thought receive attention and bring good results to your fellow workers. Try to indicate the way of progress. Try to stir your hearers to action. In presenting your thoughts do not expect to achieve success as a speaker, for those who can write are not necessarily good talkers, as the writer can testify from his own experience.

This is an age of co-operation, and if you know of ways and means to improve our business activities come forward and let us all be in position to benefit. By doing this you will be the one to receive

the greatest benefit, for the thought you put into your contribution will clarify your knowledge, and the discussion will broaden your views.

During the last decade there has been an insistent demand for stories with the "Heart" interest. This applies to fact as well as to fiction, and may be accounted for by the position of literature in the minds of the public. They are more interested in what they hear than in what they read; an evidence of this is the growth and interest in associations. They have a still greater interest, however, in what they see than in what they hear; the popularity of the "movies" being a demonstration of this preference. As printed matter ranks third in this analysis, its greatest claim for attention must come from the personal or so-called "heart" interest. This can be supplied in technical writing by descriptions of work performed or of policies carried to a successful conclusion. Another means of attracting attention and holding the readers interest is the use of illustrations that have direct application to the text.

Editing.—Although it is not to be supposed that immediately upon reading this article authors will become editors, a few notes on this feature may be of assistance to the reader in making reports of subordinates presentable for further use. Editing consists of arranging facts in logical order and eliminating useless words and duplications. As an example of editing take one of the papers read at a recent association meeting and compare the original as it appears in the "proceedings" with the abridged article published in the AMERICAN GAS LIGHT JOURNAL. The editors use the word "abridged" as a salve to the feelings of the authors. The articles are rarely abridged in the true meaning of the word; they are only edited, which means that authors often say in twenty of their pages all that they used forty pages to put down.

Writing Advertisements.—A feature of modern public utility operation which is becoming more and more necessary is that of acquainting the public with the fundamental facts concerning the technical side of operating. Perhaps it should properly be termed publicity rather than advertising, as its aim is to bring about friendly interests and indirectly promote the sale of the product, as distinct from advertising intended only to sell goods.

Successful technical advertisements are a supreme test of your ability to express yourself correctly and plainly. Do not hesitate to discuss the most complicated phases of manufacturing and distribution, the public will evince an interest if you provide the opportunity. No better demonstration of this can be cited than the electric industry; more people are familiar with electrical machinery than with gas apparatus, much to the gain of the former, and this because they have aroused a universal interest and keep feeding it.

When writing technical advertising use a suitable word or phrase as an introductory heading. Use terse, clear-cut and short sentences. Don't try to tell all the story in a single advertisement. The expenditure of several thousand dollars on an addition to your plant is worthy of several advertisements, as well as an illustrated article in the reading pages. Some companies have found it advantageous to sign their advertisements simply Gas Co. or Gas and Electric Co., especially if they have a long name. For instance, The Consolidated Gas, Electric Light and Power Company of Baltimore uses the name "Gas and Electric Company." You can give the company a personality by signing the name of the general manager to the advertisements. The Past Grand Master of New Business Publicity signs all their advertisements "Utah Gas and Coke Company, John C. D. Clark, General Manager." Similarily the advertisements of the largest company in the country read "Consolidated Gas Company, Geo. B. Cortelyou, President."

To those who desire to go into the subject more fully, the author recommends "Good Engineering Literature," by Mr. Harwood Frost. This book is short, and besides offering the encouragement of an enthusiastic writer, much valuable information is given on the mechanical side, including type, cuts, copyright, etc. The United States Printing Office, Washington, D. C., issues a manual of style which contains suggestions on the use of capitals, spelling of disputed words, etc., which can be obtained by sending a money order for 10 cents. Manuals also have been issued by varied Associations and Periodicals, notably the American Society of Mechanical Engineers.

Men of culture as well as position often say, when asked to write, that they are too busy, this excuse, however, is contrary to the experience of some of the greatest Authors who claim that they have done their best work when working under pressure. If you want to write well, write when you are busy.

From the foregoing it will be seen that writing is not such a difficult thing to do, and as it is unquestionably a profitable use of spare time, it is hoped that the advice "Write-Young Man-Write" will be heeded, with both pleasure and profit to those venturing.

Contracts for Street Lighting.

The street lighting contract recently made with Watertown, Wis., by the Watertown Gas & Electric Company is one of the first contracts to follow the recommended standard forms of the National Electric Light Association and the Association of Edison Illuminating Companies. These contracts are based on the assumption that the price for service is subject to regulation by a Public Service Commission; and that the cost of the initial installation, and of any substitute installation of better type or of additional lamps and for relocation of existing lamps, etc., must be considered in the cost of the service, including a reasonable return upon the investment made. Since the cost of service is subject to examination by the commission, the municipality is assured that it will participate in future economies, and great freedom is given it in changing the type and kind of service, should it so desire. The possibility of changes during the period of the contract is anticipated in the specification. Changes and additions to the initial installation are made at a price sufficient to cover cost including depreciation, return upon the investment and amortization of special investment, if made during the last years of the contract; but provision is made that the cost due to amortization must be refunded to the municipality should the contract be extended.

The Watertown contract is summarized as follows:

(a) *Specification of Initial Installation.*—The contract provides for a minimum of 100 lamps and the specification contains the technical and descriptive data as to type, wattage, candle-power of lamps, the type of suspension and bracket supports, the height of lamps and the location of the initial installation, the type of distribution system and the hours of lighting; and the rate for service.

(b) *Deductions for Outages.*—Should the lamps fail to burn during the hours of lighting, there is to be deducted from the company a pro rata part of the average annual rate, determined in accordance with the number of hours of outrage. The company must keep a record of the time energy is supplied to each of the circuits from which the lamps are fed, and the time of cutting off energy for the purpose of extinguishing the lamps: and of lamps reported by the police or other city department as being out of service. At the end of each month the company is obligated to furnish the city with a copy of its record of lamps out, showing the hours and minutes during the lighting period of each day during which each lamp was out of service. Twice the amount of this deduction is provided if the company fails to relight any lamp reported out of service within 24 hours, provided that there are no conditions beyond the control of the company.

These penalties are severe, since all that the utility saves during the period of outrage is the energy not used by the lamps, whereas, the deduction includes, in addition to the cost of energy, fixed charges which continue whether the lamps are lighted or not.

(c) *Additional Lamps and Changes.*—The company agrees to install additional lamps and to move or remove lamps ordered by the city within 20 days after receipt of written notice, one additional day to be allowed for each additional lamp ordered at any time over one lamp. Should the company fail to erect and light, or move or remove any lamp ordered within the stipulated period, it must pay the city as damages, not as penalty, a sum equal to one three-hundred-and-sixty-fifth part of the annual rate for one lamp for each working day of failure to comply with the order. The company is relieved of this obligation during December, January, February and March, and in case of strikes, fire or other conditions beyond its control.

(d) *Easements.*—Provision is made that where lamps are ordered installed in locations which requires the company to extend its service over private streets, the city must obtain, without cost to the company, all rights and permits from abutting property owners, when and as needed by the company,

(e) *Discontinuance of Lamps.*—The city may discontinue any lamps of the initial or subsequent installation at any time upon 10 days' written notice of its intention. If the city orders lamps discontinued, it must reimburse the company for all unamortized special investment made on account of the lamp discontinued. Nothing in this provision, however, is to be construed as giving the city the right to reduce the number of lamps below the initial number specified in the contract.

(f) *Rates for Additional Service.*—The city has the right to order additional lamps under the terms and at the rates specified in the contract for the initial installation, subject to the following conditions:

(1) *Location.*—Should a single lamp be ordered at any location

within 500 ft. of an existing lamp or circuit, the expense of the installation and necessary operating equipment is to be borne by the company; but if a single lamp is ordered at a distance greater than 500 ft. from any then existing circuit, the city must pay the added cost over and above the amount necessary to make installation at 500 ft. distance. This added cost is to be gross cost less the reasonable estimated recovery value of the material at the expiration of the contract. Should more than one lamp be ordered at any time, located on a single circuit, the entire cost is to be borne by the company if the average distance of the lamps apart measured by circuit is not greater than 500 ft., or the nearest lamp to the then existing lamp or circuit does not exceed 500 ft. If the city makes payment for lamps installed and later order other lamps between such lamps so as to make the average distance between lamps not more than 500 ft., the company must refund the payments made.

(2) *Rate of Charge.*—The company must furnish additional lamps of any type covered by the contract as ordered by the city at the rate specified for the lamps, provided that such lamps are ordered before the beginning of the last 3 years of the contract period. Those ordered during the last 3 years of the contract will be supplied subject to the rates for the initial installation of lamps, plus a sum which, when spread over the remaining life of the contract in equal monthly payments, will reimburse the company for the special investment necessary. If, prior to the expiration of the contract, the city extends the contract for 5 years, the company is to refund the city the additional charges paid for lamps installed during the last 3 years.

"Special investment" is defined to include the differerce between the cost new and the conservatively estimated recovery value of the lamp, its bracket or supports including special poles, the cost of extending lines or circuits to reach such lamp, together with the proper proportion of new special station equipment necessary for the operation of the lamp.

(g) *Substitution of Different Types of Lamps.*—The city has the right to require the company to substitute, subject to review by the Public Service Commission, and the company has the right to substitute for the type of lamps specified, new and improved lamps of at least equivalent illuminating power. If such substitution is contemplated and mutually agreed upon, the party desiring it must serve written notice upon the other party, setting forth in detail the kind of lamps it is desired to substitute. The Public Service Commission is to approve the substitution, and specify the rates of charge at which the company shall supply the new types of lamps before the work of making any substitution is started.

(h) *Compensation for Relocating Lamps.*—The city may order changes in the location of lamps, or order the service changed from overhead to under ground. For such changes in location or in character or service it must pay the company the full net cost of complying with such orders. "Net cost" is defined to include the difference between the expenditures made by the company and the estimated recovery value of the material at the expiration of the contract.

(i) *Damages.*—The company agrees that it will keep the city harmless from any claims for damages arising out of the negligent stringing of wires and erection of poles, the negligent placing of other apparatus and appliances and the maintenance and operation of the equipment for the service covered by the contract; and further that it will hold the city harmless from any claims for damages arising out of the negligence of the company, its agents, servants or employees in furnishing street-lighting service.

(j) *Disputes.*—Disputes arising out of the performance of the contract which cannot be adjusted by the city and company are to be promptly referred to the Public Service Commission.

(k) *Payments.*—The usual provisions are made for monthly payment, and for adjustment of disputes arising out of offsets and counterclaims.

The statutory provisions in Wisconsin limit the term of street-lighting contracts to ten years. Under provisions in this contract it is obvious that the period most satisfactory to the municipality would be indetermine rather than limited. In such a case the condition of termination would be compensation to the utility for the value of the special investment devoted to street-lighting purposes. Where the contract is indeterminate high amortization cost is unnecessary and changes in type are introduced at least expense. Under the limited-term contract municipalities may find it to their advantage to renew the contract at its expiration in order to secure the difference which extended use of equipment provides. The usual uncertainty, however, as to the action of the city during the last years of the contracts often postpones needed additions and improvements.

Report of Industrial Fuel Committee, National Commercial Gas Association.

HENRY O. LOEBELL, Chairman.

Immediately after the organization of your committee on industrial fuel, a plan of campaign was outlined somewhat different from anything previously attempted but which seems to have worked to the advantage of those iuterested in the industrial fuel branch of our industry. The experiences of industrial fuel committees in the past prove beyond a doubt that in a great number of cases the success in selling industrial fuel gas depended not so much upon the ability to compete with other fuels as upon the ability to compete with manufacturing conditions in the different industries. Therefore, the primary object of your committee was to prepare such data as would educate gas men to a realization of the fact that while we are selling a commodity that comes into direct competition with other fuels, our arguments on the value of this commodity must rest with our ability to sell our fuel in industrial plants at an advantage.

Every manufacturer is vitally interested in his cost of production but very seldom has he a conception of the actual cost of the fuel that enters as an item of this cost. With this thought in mind the committee has attempted to describe each industry in which gas fuel is used, so that the men engaged in selling industrial fuel gas will be able to talk intelligently upon conditions in each industry and possibly change such conditions so that, the cost of production with gas will not be any greater than with other fuels. Your committee was impressed from the beginning with this procedure, and although it entailed an enormous amount of work and study, it is certainly the shortest route by which a gas man can acquire the necessary knowledge to cope with the ever-growing demand for the correct way of applying gas in modern industrial plants.

In order to prove the desirablility of this plan a two days' session of discussions on processes of manufacture was held in June at the mid-year conference in New York, and a large attendance was attracted. From the expressions of the members present, the meeting was a decided success; the papers read and the discussions of them were of the utmost value. During the meeting and at conferences held thereafter the industrial fuel committee decided on a more extensive plan for carrying out the work started there, and adopted a similar but more comprehensive program for the Minneapolis convention. You will note from the industrial fuel program outlined for this convention that many industries are represented by short papers; so that anyone desiring information on any of the subjects treated, may bring up questions, or contribute items bearing upon the subjects discussed.

Your Committee also decided to submit a plan to the Board of Directors by which a new office shall be created in the National Commercial Gas Association, that of "Industrial Fuel Sales Expert." The plan was passed upon affimatively by the Board of Directors. and the President was empowered to employ such a man, recommended by the Chairman of the Industrial Fuel Committee, and who, in the President's discretion, has the necessary qualifications for the position.

The year 1914 does not mark any wonderful progress in new devices for burning gas, although activities in different lines by individual companies throughout the country have brought out some very useful new applications, which have been discussed during the 3 days' session. Some things worthy of mention have been developed recently which will play important parts in competition with artificial gas. One of these is the electric furnace, a few words about which will probably help some of us and inspire us towards more research effort. The successful operation of the electric furnace, announced in previous conventions. is becomming more and more in evidence to the gas industry; the high effiiciency obtained from it making it possible to compete at prevailing rates with the gas furnace. Although the first cost is considerable higher than that of a gas furnace, other advantages seem to offset this. We want to caution you gentlemen that unless we develop higher efficiency appliances for that branch of the metallurgical industry in which we have been so successful, it will slowly dwindle and the electric furnace will take its place. While on this subject we wish to assert that there are a number of ways the business can be retained and considerably increased if some effort be made to improve present furnaces, so that a higher thermal effiiciency will be obtained. It may be desirable that the incoming Industrial Fuel Committee be requested to have a special committee appointed for that work, so that we will be able to produce in the near future an apparatus that will effectively compete with the coming electric furnace and retain the business which justly belongs to gas fuel. The same

argument holds for other branches of the metallurigical industry; forging, soft metal melting, etc.

A process recently developed and adopted by the largest oil refineries in the distillation of crude oil will practically eliminate the production of fuel oil. It is natural to suppose that the price of fuel oil will increase on account of its diminishing supply until a point is reached where it will be economically prohibitive. With this in view some industries have supplemented fuel oil with solid fuel equipment, so that they may, if necessary, change their operations from liquid to solid fuel. If gas men mean to take advantage of this opportunity they must immediately act; first by producing the necessary apparatus, second by establishing rates that will make possible the securing and holding of this class of business. While the average manufacturer is willing to consider gas fuel at a slightly advanced cost, he is generally averse to using our fuel extensively at illuminating rates.

Your committee asks the president and the board of directors, as well as everyone connected with the gas industry, to put forth a little more effort in securing the right kind of men for the promotion of industrial fuel gas sales. It is the belief of this committee that the industrial fuel gas department will eventually solve most of the difficulties of the development, financing and expansion of the gas industry.

Your committee recommends that the same line of work be carried on by the 1915 committee on industrial fuel gas as has been done this year. It has been impossible to entirely cover the field of manufacturing processes and the application of gas thereto.

Your committee recommends printing the papers that have been written on various manufacturing processes in such form as will enable industrial gas salesmen to have copies of them as part of their hand-book. The educational matters in these papers should be available to all gas companies and members of the National Commercial Gas Association, and in usable form. We suggest that these papers now being printed in the Bulletin be on the same size sheets used in the preparation of the salesman's hand-book, and be available either free or at a nominal cost.

Your committee suggests that the parallel session idea, tried at this convention, be a permanent feature of the National Commercial Gas Association's annual conventions.

Your committee recommends the gathering of data relating to industrial gas advertising. so that suggestions may be sent to companies desiring advertising copy.

Your committee suggests that hereafter there be closer co-operation between the chairmen of the various committees working on different phases of industrial fuel. Much duplication of work would be prevented if the chairman of the committee on salesman's handbook. and those of other committees conferred occasionally with the chairman of the industrial fuel committee. Each could secure from the others a great deal of data and information.

Your committee suggests a nation-wide selling compaign for industrial gas appliances for the year 1915. This campaign to run simultaneously in every one of our cities wishing to subscribe toward the expenses of getting out data from the central source. The plans embrace a campaign of systematic sales of various appliances in different industries at stated times. Individual appliances or users of gas will be grouped; and a campaign carried-on the same week, throughout the country, on one appliance or in one industry. Advertising matter should be prepared at the National Commercial Gas Association headquarters; and data embracing operating costs, manufacturers' catalogs, descriptions of appliances, descriptions of manufacturing processes and the adaptability of gas thereto should all be sent out from the association office in advance of the particular week during which a special appliance or group of appliances is to be pushed. The expense is to be borne by the companies subscribing to the campaign, a subscription carrying with it direction of the campaign by the National Commercial Gas Association.

Your committee also wishes to suggest that strenuous efforts be put forth in 1915 towards securing operating costs of competing fuels. If necessary a sub-committee should be appointed to gather this information from cities which have taken an interest in such costs. If an industrial fuel sales expert is appointed by the president, this work should be directed by him. Operating cost records should be available at the headquarters of the association, not only on gas fuel, but when coal, coke, oil, electricity, etc., are considered.

COMMISSION'S CONSENT NOT NECESSARY FOR MUNICIPAL PLANT.—The Pennsylvania Public Service Commission recently ruled that the borough of Gettysburg could build and operate its own electric plant to furnish electricity for its streets without obtaining the consent of the commission.

The Measurement of Gas in Large Volumes.

Committee Report[1] to American Gas Institute, by Dr. J. F. WING, Chairman.

The measuring of gas commercially is important, whether done in large or small quantities. When in large quantities, the importance and difficulties are centered in a few large units, generally used as measures of efficiency in manufacture rather than of volume bought or sold. In any case, the value of the commodity measured is so much greater than that of free air or natural gas, that it justifies careful oversight; and, in general, measuring implies the utmost practical accuracy. The measurement of this invisible product has always been a subject of doubt to the community, and often of not much less to the gas man.

The only meter whose measurements we can really see is the gas holder. All other methods use closed vessels, and an external indicator. They have moving parts to get out of order, or surfaces that may become clogged, or indicate by delicate measurements; and all have the possibilities of indicating incorrectly, and must be checked by periodic tests to insure their accuracy.

The methods of measurements come under two classes:

I. Direct or Positive Methods, in which the gas fills a known space in a moving apparatus, which registers the motion.

They comprise:

Gas holders.
Wet drum meters.
Diaphragm meters.
Calibrated exhausters.

II. Inferential Methods, in which the total quantity of gas is not actually measured, but is subjected to various conditions and the volume inferred from some effect of heat, pressure or impulse.

These comprise:

Velocity meters; such as the Venturi meter, the Pitot tube, calibrated orifices, anemometers, rotary meters and estimating the flow in pipes.

Proportional or shunt meters; in which a fraction of the total volume is measured by direct methods.

Calorimetric meters; in which the volume is ascertained by the electrically measured heat required to raise its temperature.

It is proposed to discuss these devices from the points of view of practicability and reliability.

All can be set up, calibrated carefully and then will measure with commercial accuracy under the same conditions for a longer or shorter time. If subjected to changed conditions without compensating calibration, there are different degrees of reliability. The question of duplication of results is most serious, for several are built from designs of successful ones and used without preliminary comparison with a positive measuring standard, and often under different conditions from the original. No builder of a wet station meter would guarantee its accuracy, even if built with the closest possible imitation of another, without testing it for registration as well as for leaks.

Gas Holders.—Little need be said about large gas holders. Under favorable conditions of sunlight and temperature they are accurate, but otherwise they are suitable only for a rough measurement of gas as manufactured or when transferred. The small calibrated gas holder is the standard by which all measuring devices are finally tested.

Wet Drum Station Meter.—For measuring large volumes the station meter is the most reliable instrument we have. As a secondary standard, all other devices are referred to it. It has been classed "among the most beautiful of mechanical inventions, simple and automatic in operation, while assuring the absolute correctness of the work it is designed to do."

Its accuracy does not depend on the constancy of many factors. It measures positively, by displacement, gas of any gravity, and, within wide limits of temperature and pressure, even when very dirty.

Usually station meters do not get a fair share of attention. It is difficult to oil the main shaft properly. The index and gears must be oiled with good light oil occasionally, and the stuffing box of the secondary shaft refilled with greased wicking. It is well to have any noises diagnosed by a competent man. After length of service some moving parts may give out, and the comparitively light drum will be corroded by oxygen in the gas, or that contained in the water fed to hold the water level, or by casual ammonia or sulphuretted hydrogen in the gas. It may be badly corroded and

1. Slightly abridged.—EDS.

still measure correctly, then soon after be perforated in hundreds of places by the strain of hard running or of starting-up. Bolts and rivets may work loose or fall out. A leaking condition can be discovered by a standstill test on each compartment of the drum.

The following are careful tests on three 16-foot Hinman drum meters, 15 years old, taken 3 and 5 years after being overhauled:

Three years after overhauling:

No. 1—1% fast. No. 2—⅓% fast. No. 3—$\frac{8}{100}$% slow.

Five years after overhauling:

No. 1—½% fast. No. 2—$\frac{4}{100}$% slow. No. 3—⅓% slow.

These, certainly, were as accurate as could be hoped. Before being overhauled they were in very bad condition.

In other respects all wet meters are unsatisfactory. They are costly, cumbersome, heavy, and require a large space for installation; a 16-foot meter weighs over 100 tons filled with water, and necessitates particular care in a foundation. They are not flexible for overloads. A 16-ft. meter rated at 4,000 M per day passes 6,000 M at considerable risk. On account of all this, much thought has been exercised to devise more convenient apparatus, and with considerable success.

If the wet station meter were the main subject of this report, it would include a reprint of the detailed directions of the Trustees of the Educational Fund, in answer to the question, "Describe the testing or proving of a station meter, giving each step of the work from putting it out of use in order to test it, to putting it to work again after it has been tested."

Data of Wet Station Meters.

Donald McDonald, 1904.—Proceedings of Gas Congress.

Size. Ft.	In.	Capacity per Hour in Cubic Feet with 1-inch loss		Usual Size of Connections. Feet.	Weight of Meter. Lbs.	Weight of Water. Lbs.	Weight of Meter and Water. Lbs.
		Parkinson.	Hinman.				
4	....	5,200	8,000	8	3,800	2,200	6,000
4	6....	6,800	11.250	8	4,950	3,100	8,050
5	....	8,500	14,500	8	5,950	4,200	10,150
5	6....	10,400	18,000	10	7,450	5,650	13,100
6	....	12,400	21,750	10	8,750	7,350	16,100
6	6....	14,700	25,750	12	10,500	9,300	19,800
7	....	17,100	30,000	12	12,250	11,500	23,750
7	6....	19,800	35,000	12	14,360	14,000	28,350
8	....	22,500	40,000	12	16,600	17,250	33,850
9	....	28,800	51,000	16	24,000	24,500	48,500
10	....	36,000	63,000	16	29,500	33,500	63,000
11	....	44,000	77,000	16	36,000	44,200	80,200
12	....	53,000	92,000	16	44,500	57,500	102,000
13	....	63,000	109,000	20	54,000	73,300	127,300
14	....	74,000	128,000	24	66,000	91,500	157,500
15	....	86,500	150,000	24	80,000	112,500	192,500
16	....	100,000	173,000	24	95,000	136,000	231,000

Diaphragm Meters.—Diaphragm meters do not have capacity to measure the volumes we call large. They are positive displacement meters, of a size suited for retail measurement. The largest, a 500-light meter, is not good for more than 5,500 feet per hour.

Calibrated Exhausters.—Calibrated positive exhausters or blowers offer a direct method for the approximate measurement of gas. They are displacement meters, because they propel a volume of gas with every revolution, but they lack the accuracy of a wet meter because the gas compartments are not water sealed and inevitably leak some gas past the contact surfaces back to the low pressure side.

A blower or exhauster in good condition that has been run long enough to acquire a coating inside, is a better measurer than is generally supposed, if temperature and pressure are taken into account; and if the difference of pressure increases as the square of the speed, the leakage will be a constant percentage. If this last condition is not fulfilled, they leak more proportionally at slow speeds.

If a blower is running well, it is more satisfactory and less liable to unsuspected derangement than an inferential meter. Considering the advantage of a counter and remembering the difficulties attending the reading of small pressure differences, a calibrated exhauster is quite as accurate as a calibrated Pitot or Orifice meter. There is always some uncertainty as to the efficiency of the last two.

Venturi Meters.—There are many cases in the industries where very large volumes of gas must be measured and where positive wet meters are prohibited by the expense, which is disproportional to the value of the gas and to the accuracy required. Such are air, natural gas, blast furnace and other fuel gases, which may be delivered as a commodity, or need to be controlled in some operation. For these purposes substitutes called inferential meters have been developed.

One such device is the Venturi meter, a contracted section of of pipe laid in a pipe line, and is comparatively inexpensive and convenient to install. The volume of gas passing is calculated by observing the pressures in the line and in the narrow part (called the throat) with the data of the areas of the meter and the condition and properties of the gas. The throat causes a decrease in pressure and increase of velocity. The general formula of the meter is derived on the assumption that the change in the gas between the entrance and throat of the meter takes place without gain or loss of heat. Therefore, the drop in potential energy shown by the pressures, is equal to the increase in the energy of motion indicated by the respective velocities at the entrance and at the throat.

While the Venturi meter is very accurate if it is clean and located with a considerable length of straight approach and the pressure readings are taken very accurately, it is handicapped by having a very complicated formula for expressing the volume of gas. The computation is tedious and not simple. This is the general formula:

$$Q = 210{,}840\, A_2 \frac{T_s}{P_s} \sqrt{\frac{N}{(N-1)\,GT_1}}\, P_1 \left(\frac{P_2}{P_1}\right)^{\frac{1}{N}} \sqrt{\frac{1-\left(\frac{P_2}{P_1}\right)^{\frac{N-1}{N}}}{1-\left(\frac{A_2}{A_1}\right)^2\left(\frac{P_2}{P_1}\right)^{\frac{2}{N}}}}$$

multiplied by an efficiency factor less than one.

- Q = cubic feet per hour on absolute pressure and temperature bases P_s and T_s.
- N = ratio of specific heats at constant pressure and constant volume.
- G = specific gravity of gas.
- A_1 = area at entrance in square feet.
- A_2 = area at throat in square feet.
- P_1 = absolute pressure at entrance, pounds per square inch.
- P_2 = absolute pressure at throat, pounds per square inch.
- T_1 = absolute temperature at entrance, Fahrenheit.

An approximate formula for a Venturi passing steam, with a discharge pressure less than 0.6 of the initial pressure, is the same as that for a nozzle:

$$\text{Lbs. per minute} = \frac{\text{Absolute initial pressure} \times \text{area in inches}}{1.16}$$

Meters for blast furnace gas for a 60-inch line have 28-inch throat, and will measure up to 3,000,000 cubic feet per hour with a differential of about 20 inches water.

Tests of Venturi Meters.—Reports of experiences are not unanimous in satisfaction. One reporter described a meter which collected deposits of naphthalene in the throat and stopped up the pressure holes. This deposition was then prevented by steam-jacketing. From this arrangement or some other cause, the measurement was very far out, and the venturi was replaced by an electric meter, which is not troubled by naphthalene, although some deposit has been noted in the entering pipe; and it measures consistently.

Another company reports a 10 in. x 3¼ in. meter installed to measure fuel gas. The registering device is calibrated to the total gas under standard conditions when the gas passing the meter is at 95° F., 9.6 inches water pressure and sp. gr. 0.49. When the conditions are different a correction factor is used.

This Venturi was on a line with a wet meter, by which it was first adjusted. This is not as severe a test as putting a meter in service as it comes calibrated from the makers.

The following were the metered results:

Time	Wet meter Cu. ft. free gas	Venturi meter Cu. ft. free gas
11:30 A. M.	000	000
12:00	25,100	24,800
12:30 P. M.	52,200	52,000
1:00	82,850	82,500
1.30	112,700	112,500
2:00	143,450	143,500
2:30	174,900	174,800

A 12 in. x 6 in. Venturi has been connected to the station meter of the Providence Gas Company for two years, and gives very satisfactory agreement. The registering gauge was calibrated for the

average conditions of the water gas made. This meter is intended to measure a minimum of 30,000 cu. ft. per hour. We have data showing the comparison, and, also, the limitations:

Variations of Venturi on single days during four months:

1913	Max. fast Per cent.	Min. fast Per cent.	Max. slow. Per cent.	Min. slow Per cent,	Per Month Per cent.
August	1.23	1.23	6.84	0.51	2.13 slow
September	1.66	0.79	3.78	0.40	1.54 slow
October	3.52	0.30	5.10	0.31	0.98 fast
November	3.17	0.41	0.52	0.20	1.66 fast
Average for four months					0.14 slow

NOTE:—Large differences are ascribed to shutting down and starting.

Careful comparative tests were made on April 13th and 14th, 1914, between the 14 ft. station meter and the Venturi with a type Q register graduated in cu. feet free gas at 30 inches and 60 deg., for 10 inch pressure and 0.675 sp. gr.

The two day's tests agreed closely on the average, but the data of the latter only are given, since in that the rates of flow varied more.

	Registration		Corrected					
Time	Station meter	Venturi meter	Station meter	Venturi meter	Venturi Per cent	Venturi Minute reading	Manometer	Loss of head
11 A.M.	62,000	64,000	62,750	63,750	+1.5	84.000	2.1″	0.3″
12	92,000	95,000	92,700	94,600	+2.0	96,000	2.7	0.35
1 P.M.	96,000	98,000	96,750	97,600	+0.9	92,000	2.5	0.33
2	94,000	95,000	94,600	94,700	+0.1	92,000	2.55	0.33
3	61,000	61,000	61,500	61,000	—0.8	62,000	1.25	0.15
4	61,000	60,000	61,500	60,000	—2.4	64,000	1.30	0.2
5	56,000	56,000	56,450	56,000	—0.7	64,000	1.25	0.2
6	57,000	57,000	57,500	57,000	—0.7	53,000	0.9	0.15
Totals	579,000	586,000	583,750	584,650	+0.15			

1.2 per cent. fast.

The variation of the specific gravity during the test was 0.668-0.677 by one apparatus, 0.661-0.662 by another.

It is to be noted that the manometer gives a good readable differential pressure for a small loss of head while the gas is passing through the meter.—a great advantage over the Pitot and Orifice types,

Pitot Meters.—This is the most interesting of all devices for measuring gases. The Pitot tube measures the velocity of flow of gas in a pipe by showing the velocity head caused by the impact of the current, on a pressure gauge of which the other arm is balanced by the pressure in the pipe (called the static pressure).

The general formula for Pitot meter and for an orifice is:

$$Q = 218.44 E d^2 \frac{Ts}{Ps} \sqrt{\frac{hP}{TG}}$$ in which

Q = flow in cubic feet per hour at Ts and Ps
E = efficiency of the Pitot tube or orifice
d = diameter of the pipe or orifice, inches
Ts = absolute storage temperature base, degrees Fahrenheit
Ps = absolute storage pressure base, pounds per square inch
h = height of water column in inches
P = absolute pressure of flowing gas, pounds
T = absolute temperature of flowing gas
G = specific gravity of flowing gas, air = 1

The calculation of a varying flow in the same pipe under the same conditions is quite simple theoretically, since h, the water pressure in the differential gauge is the only varying factor and the rest may be grouped in one quantity; but practically it is difficult to determine h, the differential pressure, correctly and the value of E, the efficiency, is uncertain.

As a means of measuring gas in large volumes, the method of inserting a Pitot tube in a main in a predetermined position merely serves as a rough indicator and may be wrong to the extent of 10 or 20 per cent. or more. To profit by the possibilities of the Pitot tube for accurate measurement it is necessary to be much more painstaking. The aperture to the static pressure connection must be such that it is not influenced by the flow of the gas current. The pipe is divided in 5 concentric annular rings and 4 readings are made in the center of each ring on 2 diameters for the dynamic pressures, and the square roots of the 20 readings are averaged.

From experiments in the laboratory of the University of Wisconsin, W. C. Rowse derived the following results and conclusions:

"If a Pitot tube is inserted in a pipe conveying gas and a traverse made over the cross-section of the pipe, it will be found that the highest velocity exists at the center of the pipe and the lowest at the walls. For this reason it has been customary to determine the point in the cross-section of the pipe where the velocity corresponds to the mean velocity of the whole cross-section, and to keep the tube at that point for the determination of the quantity of flow. This point varies according to the condition of roughness of the interior surface, and other accidental conditions of the pipe in which the tube is inserted, and it is necessary to determine it for each particular pipe used. When a tube is used as a permanent gas meter, it is better, because of the fact just noted, to construct the pipe with extreme care, the interior of uniform size and highly polished, and then to place the tip in the exact center. This necessitates the inclusion in the theoretical formula of a factor called the "efficiency" of the tube, in order to reduce the flow, as indicated by the tube readings, to the mean velocity.

"The Pitot tube is reliable within approximately 1 per cent. when the static pressure is correctly obtained, and readings taken with a sufficient degree of refinement; in order to obtain this degree of accuracy the Pitot tube should be preceded by a length of pipe equal to 20 or 30 times the pipe diameter, in order to make the flow of gas nearly uniform across the section.

"All the methods of obtaining the dynamic head used in these experiments give accurate results.

"The most reliable and accurate means of obtaining the static pressure is the piezometer, or its equivalent, the results of 138 tests using the piezometer static pressure agreeing with the Thomas meter within an average of 0.33 per cent.; these results show beyond doubt that the static pressure is constant across any section of a pipe in which gas is flowing at a uniform rate,

"It appears that an approximate relation exists between the mean velocity head of a gas flowing through the pipe and the velocity head found by placing the tube in the center of the pipe. For a 12 inch galvanized pipe results within 2 per cent. may be expected by taking the mean velocity head as 0.80 of that at the center.

"The considerations which may prevent even an absolutely correct Pitot tube from giving true results are as follows:

"The gas flows through the pipe in a wave or spiral motion, and at no time is the velocity uniformly distributed across the pipe, being greater in one quarter than in the other three quarters; the quarter of highest velocity may or may not be on the diameters where Pitot tube readings are taken.

"The velocity on the diameters where Pitot tube readings are being taken may be constantly varying during the period of time necessary to obtain the readings; thus the average of all readings may be slightly too large or two small.

"The gas flow can only approach, never reach, the ideal conditions of parallel flow and the Pitot tube is correct, theoretically, only when the tube is exactly parallel to the current."

The ingenious devices for reading small differential pressures have been described many times. These are based on the principle of using an inclined gauge to multiply the motion, and of using some other and lighter liquid than water and with less adhesion to glass, such as ether, alcohol, gasoline or kerosene, of which the specific gravity must be known.

With the inclined manometer, some experimenters have succeeded in measuring gas with 1/10 inch differential. Here an error of 1/100 inch is about 6 per cent. Usually vibration prevents any such close reading. This corresponds to the rapid flow of about 30 feet per second, or a loss of pressure in 1,000 feet of 12 inch pipe of 2.6 inches. It is possible, with a gauge slanting 40 to 1 and with a mobile liquid, to measure velocities of 8 feet a second with some satisfaction. Recent progress in velocity measurements has been in the direction of recording instruments.

Calibrated Orifices.—The measuring of large quantities of gas calibrated orifices is so rough that it would scarcely be applied to artificial gas. There must be a considerable loss of pressure to obtain a significant measure of the quantity, and back pressure is objectionable. The size and shape of the orifice or mouth piece influences the coefficient of efflux, which also changes for varying differential pressures.

This method is quite satisfactory for controlling the flow of air under constant conditions, as from a blower to a water gas generator.

A simple formula for the flow of a gas through a circular orifice in a thin plate, due to small differences of pressure, and at ordinary temperature is:

$$\text{Velocity, feet per second} = 40 \sqrt{\frac{\text{Press. in inches of water}}{\text{Specific gravity}}}.$$

A calibrated orifice must be used under very nearly the same conditions as in calibration, and must be exactly the same shape when duplicated. Neglecting either of these conditions may in-

volve a change of 10 per cent. in the efficiency. If one were relying implicity on this measurement, a change of 10 per cent. in the amount of air blown into a water gas generator would make a great difference in the temperature.

A related method of measuring gas is by its loss of pressure by the flow through pipes. It is cruder and more uncertain because it involves the friction in the pipe. It has its field of uselulness in the design of pipe lines.

The oldest formula, Dr. Pole's, is applicable to low pressure gas and is:

$$\text{Cubic feet per hour} = 1350d^2 \sqrt{\frac{pd}{sl}};\ \text{wherein}$$

d = diameter in inches
p = pressure in inches of water
s = specific gravity
l = length in yards.

Measurements by Pitot tube and by Calibrated Orifices are based on the same physical law and involve the difficulty of reading slight differences of pressure. The Pitot tube has the advantage of not interfering with the flow of gas; but the process of searching the whole main for impact pressures is complicated and gives rather uncertain results, and, although taking a simple observation is simpler, it is still more uncertain. The orifice device has the advantage that both high and low pressures are taken at static pressures and with small relative error; but it involves the trouble of inserting a diaphragm or nozzle in a pipe line with the serious disadvantage of causing back pressure.

Anemometers.—An anemometer is a mechanical device to show the velocity of a gas in a conduit, by registering the revolution of vanes caused by the current. Besides the difficulty of duplicating one, it has the handicap of being very delicate and liable to respond differently to the current at different times. Also, as the velocity of the gas varies in different parts of a conduit, it gives an inaccurate or uncertain indication of the velocity.

Rotary Meters.—A rotary meter is built on the plan of an anemometer, but is a much more reliable indicator because a constant proportion of the flow of gas at the varying velocities impinges on the vanes. When accurately calibrated and in good order, it is a serious competitor of the station meter for accuracy at a wide range of rate; and has great advantages in convenience and cost over a station meter of the same capacity.

It has the disadvantage of delicate mechanism and that the pipes and impact tubes may become coated with material deposited from the gas, and it will then register incorrectly. The accuracy of its mechanism must be determined by a test against a station meter or a holder.

One gas company has had rather mixed experience with them. Two small ones used for measuring air to purifiers, were correct when new within 2 per cent., at the range guaranteed. They have been clogged by moist dust several times in 5 years, but after cleaning have registered as correctly as at first.

Of two meters of 250 M hourly capacity, installed as work; meters on water gas, one tested when new

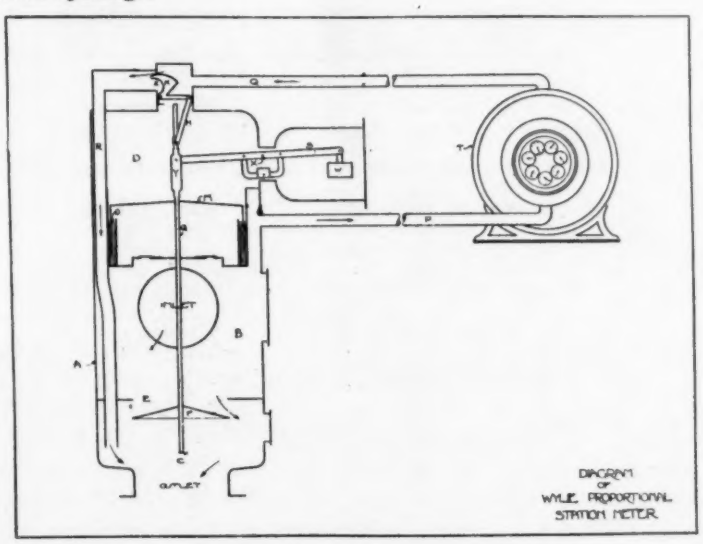
at the rate of	35 M per hour	3.5 per cent. fast
at the rate of	50 M	1.8
at the rate of	100 M	0.8
at the rate of	150 M	0.8
at the rate of	200 M	1.6
at the rate of	220 M	1.4

the other one was 2.8 per cent. fast on the average, and had the gear changed to correct it. After being used on water gas for four winters, both tested within 1 per cent. and were found clean on inspection. They have had no repairs.

Proportional Meters.—In the proportional meter only a portion of gas passing is actually measured and from it the total volume is determined. The apparatus is designed to maintain at all rates of flow a constant ratio between the large unmeasured volume and its measured fractional part.

The Wylie and the Westinghouse Proportional Meter are examples of this type, both used extensively on natural gas. The Wylie meter is used in some gas works as a station meter. It consists essentially of two parts: the main shunt and the tally; the latter a small wet meter, which measures only a part of the volnme flowing through the shunt, the dial geared to register the total volume.

In the main shunt are two valves mechanically connected to operate in unison, and controlled by a diaphragm. The large valve controls the main or shunted volume passing through the shunt, and the smaller valve the co-efficient or fractional volume measured by the tally. This mechanism is to obtain and maintain a constant ratio of pressure absorption or drop through the proportionate valve openings.



In the illustration, A, is the main shunt, with an inlet and outlet divided by partitions into three compartments B, C and D. The opening, E, between the inlet compartment, B, and the outlet compartment, C, is controlled by the valve, F, mounted on the lower end of the vertical valve stem, G. The upper end of this stem is connected with the co-efficient valve, K, controlling the opening Z. The valve, K, is pivoted at, L, and is operated by the connecting rod, H, attached to, G. The diaphragm, M, is in the form of a holder bell, rigidly secured to the stem, G, and separates the compartments, B, and, D, by the annular seal, O. In some types a dry diaphragm sealed with flexible material is used. The inlet compartment, B, communicates with the inlet of the tally, T, by the pipe, P; the outlet of tally communicating to compartment, D, by pipe Q, which conveys the gas through the co-efficient valve, K, and pipe, R, to the outlet compartment C. The stem, G, and its appurtenances are balanced by the weight, W, on the lever, S, fulcrumed at, X. The weight, W, is sufficient to close the valves when no gas is passing. The ratio of the area of the openings, E, and Z, controlled by the proportionate valves, is the same as the ratio of the determined capacity of the tally meter to the volume passing through the main shunt. The effective area of the diaphragm, M, is usually made double the area of, F, which must be considered as a diaphragm acting in opposition to, M.

Differential pressure gauges indicate the pressure absorbed by the shunt and tally.

Gas enters B, through inlet as indicated by the arrows. The area of, M, being greater than, F, the tendency is to keep, F, closed until some gas had passed through, P, and the tally into compartment D. The outlet pressure of the tally acting on, M, causes the stem, G, to descend, opening, F and K, and to assume a position in which equilibrium is established between the pressures acting on, F and M. In order that the ratio of the volumes of gas passing through openings. E and Z, may be constant, it is necessary to preserve a constant ratio between the differential pressure or drop through these openings. This is accomplished by the diaphragm, M, as follows: As the valves are in equilibrium, it is evident that the total effective pressure exerted on, M, is equal and opposite to that acting on, F. The effective pressure acting on, F, is its area multiplied by the drop of pressure through the opening, E, which is the total differential absorbed by the apparatus. Similarly, the effective pressure acting on, M, is its area times the drop through the tally. Since these quantities are equal, and since the area of M is twice that of, F, it is evident the drop through the tally is one half the total drop between inlet and outlet, and the other half must be the drop through the opening, Z, controlled by the co-efficient valve, K. The ratio of drop through E and Z will therefore be constant irrespective of the pre-determined ratio set for the areas of, M and F. As gas is passing through the tally must lose some pressure, whenever there is a variation in the amount of pressure absorbed by the tally the diaphragm, M, will move the stem, G, into a new position of equilibrium, thus varying the openings, E and Z, in response to the variations of volume.

To demonstrate the theory of operation, let us assume that in a certain position of the valves,

(*Continued on page 10.*)

THE AMERICAN GAS LIGHT JOURNAL

Entered at the Post Office, New York City, as Second-Class Matter.

Published weekly at 42 Pine Street, New York City.

Telephone Call, John, 2996. Cable, Am-Gas.

E. P. CALLENDER, President.
A. M. CALLENDER, Vice-President and Treasurer.
CHARLES H. WADELTON, Secretary and Manager.

SANFORD K. CAMPBELL, Editor.

NEW YORK, MONDAY, JANUARY 4, 1915.

Prosperous 1915.

We are at peace. Thanksgivings have been said and resolutions made. This is Monday, the first real business day of a brand new year, which can be a prosperous one if we consistently and everlastingly try to make it so.

The volume of business is bound to be equal to the average of the last 10 years—we use this illustration for the calamity howlers. It should be better than the average.

The American Gas Light Journal shows its faith by its acts. We are spending more money every week to supply our readers with more news and better articles, and new type and better workmanship.

We know this is going to be a prosperous year for us, and we trust that our efforts will be an incentive, as well as an aid, in making it a prosperous year for our readers.

Write More and Honor More.

The trade publications of an industry reflect the attitude of the men that make it up. The gas business has suffered from lack of efforts on the part of those in authority to bring records of accomplishment to the attention of their associates. There has been a paralell want of appreciation by workers of the genius and ability of their fellows. These parallel shortcomings are good subjects for New Year plans. Tell about your progress and honor the man who achieves something.

Suggestions lead to improvement, and we trust that they will be more spontaneous and numerous during the year just beginning. From the suggestions in the article on "Writing," by Mr. H. Thurston Owens, in other columns, it will be seen that writing is not one-sided work, and we hope his appeal will bear fruit.

Industrial Fuel Data.

The report of the Industrial Fuel Committee of the N. C. G. A., which will be found in other columns, is notable for its recommendations rather than data. The most valuable recommendation that it makes, is that concerning the publication of descriptive articles on the manufacturing industries showing the application of gas for heating. To put it in another light, it is the reverse of a Catalogue inasmuch as that contains descriptions of apparatus, while the articles desired will cover their application to manufacturing requirements. Descriptions of this kind will be valuable, as the salesman can apply them to the conditions in a manufacturing plant in his own community, and make recommendations based on the experience of others.

English Gas Works Shelled.

When the German fleet shelled the towns of Scarborough, Whitby and Hartlepool, the gas works were the targets selected. The "Gas World" says: The Hartlepool works sustained a great deal of damage. The three gasholders were struck, and in two cases the escaping gas was fired. It is thought from this that some person aboard the warship was acquainted with the topography of the town, as the higher buildings in the line of fire were untouched. The fire at the works was soon put out, but the town was deprived of its supply of gas. The engineer, Mr. A. W. Branson, said on Thursday that he hoped to get one of the holders, having a capacity of 750,000 cubic feet, into work the following day. One of the other holders was struck on the crown and the other in the side. One is hopelessly smashed, and will take months to repair, but the other, with a capacity of 1,500,000 cubic feet, is not quite so badly injured. No other serious damage was done to the plant. Gas making was stopped at once, but it could have been carried on without interruption if there had been any storage. Seven or eight of the men were injured, some of them seriously, but no one was killed. About twenty shells fell on the works. Mr. Branson has charge of the waterworks also, and some damage was done there, the chief injury being the cutting of a steam pipe, which resulted in the stopping of the pumps. There was no damage to gas mains by shells exploding in the streets.

At Whitby, several shells fell around the gas works, but, luckily, no damage was done to either holders or plant. On subsequent examination of the works by the manager, Mr. W. M. Galleway, a piece of shell four inches long was found on the top of a holder, which was dented, but not pierced. A 3-inch main was broken in the town by a bursting shell, but without injury to life or property. Several houses were partially demolished, and the company's fitters have since been engaged in examining meters, etc., for leaks.

The Scarborough Gas Company were lucky in that their property sustained practically no damage, though shells fell all around the works, causing great destruction in the neighborhood. A splinter of shell made a hole in one of the gasholders, but only about 10,000 cubic feet of gas was lost. The plant was kept running during the bombardment, and immediate steps were taken to cope with damaged pipes, and every house struck was visited by the company's men. The house of the engineer, Mr. A. P. Allan, was untouched, but a school opposite was struck. The company are insured against war risks at Lloyds. An eye witness is reported to have declared that the ships aimed at the gas works.

Committee on School Lighting.

A Committee on School Lighting has been organized in the Illuminating Engineering Society, under the chairmanship of Mr. M. Luckiesh, Nela Park, Cleveland, O.

The object of this committee is briefly as follows:

To prepare a lecture dealing with conservation of eyesight of school children, to be presented before school authorities; the lecture to include the fundamental principles underlying good and bad natural and artificial lighting, the use of window shades, the color of walls and ceiling, glare from blackboards, glazed paper and other polished surfaces, and general information on how to use the eyes.

To report on lighting conditions in schools.

To prepare plans and specifications of model class-rooms.

To introduce brief courses in lighting as a part of the home-making and practical physics courses.

To construct a miniature model class-room for exhibition purposes.

To prepare a code on school lighting suitable for legislative guidance.

To give general publicity to the importance of good lighting as conserving vision.

The importance of the work of this committee to the public at large is evident when we consider that 18,000,000 pairs of eyes in our public schools are daily subjected to the strain of study and other work in which lighting is a factor.

Announcement.

In our next issue the first of a series of monthly news bulletins from the Southern Gas Association will appear. The matter has to do strictly with that organization, and we feel honored in being selected to act as their spokesman.

WESTCHESTER LIGHTING COMPANY CASES.

The Public Service Commission of the Second District, New York, has decided the Westchester Lighting Company cases, which were complaints of residents of White Plains, Port Chester, Tarrytown and North Tarrytown, Irvington and Eastchester as to rates. The opinion is by Commissioner Martin S. Decker, and holds that respondent's electric rate of 15 cents per kilowatt hour is excessive, unreasonable and unjust, and for the future should not exceed 12 cents; and also that the minimum monthly rate of $1.00 is excessive and should be reduced to 75 cents.

On gas rates the commission holds that upon the valuation record the company's income does not afford a rate of return which can be reduced by lawful order; but strongly recommends the company to reduce its gas to $1.25 per 1,000 cubic feet as a general rate, and lower in the thickly settled portions of the Port Chester, White Plains and Tarrytown districts. The company's valuation of its gas and electric properties in the Port Chester, Tarrytown and White Plains districts and in Eastchester was $6,800,000. The commission, in determining the amount on which the company was entitled to return, reduced this to $4,300,000. The gas rate in Eastchester is treated separately, and it is recommended that some material reduction be made. The present rates are: Port Chester, $1.40 for light and $1.25 for fuel; White Plains, $1.40 for both light and fuel; Tarrytown, $1.50 for light and $1.25 for fuel; Eastchester, $1.50 for both light and fuel.

Following is an abstract of the general conclusions:

The Commission says the gas rates in Port Chester, White Plains and Tarrytown are high upon general observation. The two rates applied, except in White Plains and Eastchester, entail the maintenance of two meters, an unnecessary duplication of capital, of accounts and accounting, and of inspection and meter reading. The respondent could effect substantial economy by combining this work and these meters through establishing a single rate. It ought to do so by reducing the lighting rate without increasing the fuel rate. A net rate of $1.25 throughout all the districts could properly be applied.

The company's returns from its gas business were less in 1913 than in 1909 by a substantial amount, although a great deal more gas was furnished, because operating expenses increased in greater ratio than gross earnings; and these returns, as applied to the valuation worked out by the Commission gives a rate of return which for all of the gas districts yielded in 1909 but little more than 4 per cent. The Commission says that upon the figures for 1909 and 1913 it has no basis to formally order a reduction of rates. Nevertheless, the Commission says it would be good business policy and lead to freer use of gas if lower rates were made. The Commission says this view is supported by the fact that the company has extended many gas mains from the villages proper into comparitively thinly populated territory, thereby making unprofitable capital investment for the present and for sometime in the future.

The Commission, without taken it into account in its decision, also says it is greatly to be regretted that the company's enormous interest charges, arising out of securities having little, if any, relation to the actual property account, force it to secure every penny possible in earnings, and limit the margin for gas rate reductions which would place its large business in these districts upon a basis of rates whereby customers would have some greater inducement to indulge in freer use of gas for fuel purposes and also for light. The commission also points out that gas is competitive with coal, and that the impression made upon customers by these high gas rates is doubtless continuous and becomes stronger monthly. It is clear to the Commission that as between Mount Vernon and Yonkers on the one hand, and these districts in their populous portions at least on the other, the variation in the price of gas is too great.

In the electric department the Commission finds that the business is profitable. It also holds that separate complaints having been presented concerning the electric rates, such rates require separate consideration. It is pointed out that the Port Chester district takes more electricity to-day than either Mount Vernon or New Rochelle. The commission says there is fair reason to believe that in the reasonably near future respondent should contemplate seriously still further reduction of its maximum electric rate as applying over its whole territory; though it points out that the rates in Mount Vernon and New Rochelle are not embraced in these proceedings.

The company's total operating income from both electric and gas service was greater in 1913 than in 1909 by $71,954, but deductions increased during that time by over $314,000, and from such deductions from income it has a book deficit in 1913 of $188,000. The commission points out, however, that the bulk of the interest charge increase during the four years results from the increase in the interest rate on New York and Westchester Lighting Company mortgage bonds. The interest on these has increased under the terms of the mortgage from 1½ per cent. in 1908 to 4 per cent. in 1914. This mortgage of $10,000,000, together with debenture bonds of $2,500,000, were placed on the property in 1904 in carrying out a transfer of control of the property. The bonds and the interest thereon are guaranteed by the Consolidated Gas Company of New York, which owns all of the stock of the Westchester Lighting Company. Control of the property was deemed of great consequence to the Consolidated Company since the Westchester Company was in possession of franchises capable of being used in the City of New York and in adjoining Westchester county territory.

[OFFICIAL NOTICE.]

Wisconsin Gas Association.

OFFICE OF THE SECRETARY-TREASURER,
MILWAUKEE, WIS., Dec. 10, 1914.

To the Members of the Wisconsin Gas Association: Under instructions contained in a resolution adopted at our last annual meeting, your Executive Committee has completed arrangements by which the Annual Convention of the Wisconsin Gas Association will be held jointly with the Wisconsin Electric Association, on January 20th, 21st and 22d, 1915, at the Hotel Pfister, Milwaukee.

The first day of the meeting will be devoted to matters pertaining to gas interests, including the usual order of business provided under our constitution. The second day's session will be held jointly with the Wisconsin Electric Association for the presentation and discussion of subjects of common interest. The banquet will be on the evening of the second day, this also a joint affair.

The third day will be devoted exclusively to the business of the Electric Association.

Papers on appropriate subjects are in the course of preparation, the titles of which, and other details relative to the convention, will be given in a later announcement.

In order to determine the advisability of continuing our annual meetings in conjunction with those of the Electric Association, it is particularly desirable that this meeting be well attended, so that any action which may be taken relative to this subject represent as nearly as possible the unanimous wish of our Association. Remember the new dates—January 20th, 21st and 22d, 1915.

Respectfully, HENRY HARMAN, Secretary-Treasurer.

[OFFICIAL NOTICE.]

New England Association of Gas Engineers.

The Forty-fifth Annual Meeting of the New England Association of Gas Engineers will be held at Young's Hotel, Boston, Thursday and Friday, February 18th and 19th, 1915.

Papers are being prepared as follows:

"New Vertical Settings at Fall River," C. W. Hunter, Boston.
"Concrete Piles for Holder Foundations," F. E. Drake, Lynn.
"Mantle Maintenance," J, P. Conroy, New York.
"Industrial Fuel Gas," W. H. Bradley, Springfield.
"B. T. U. Determination," Mr. Brewer, Meriden.

Mr. H. N. Tolles, of Chicago, will address the meeting and be at the annual dinner.

Applications for Membership should reach the Secretary by February 17th.

N. W. GIFFORD, Secretary.

(*Continued from page 7.*)

The Measurement of Gas in Large Volumes.

V = volume passing through E.
v = volume passing through Z.
D = total differential or drop through E.
d = drop through tally.
$D - d$ = drop through opening Z.
R = ratio of areas of proportionate valve openings.
r = ratio of areas of diaphragms M and F.

Theoretically the flow of gas through an opening is directly proportional to the area of the opening and to the square root of the drop of pressure through it. Assuming the area of Z to be 1, the ratio of the volumes is

$$\frac{V}{v} = \frac{R\sqrt{D}}{\sqrt{D-d}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Again, assuming area of F = 1, and since the diaphragms are in equilibrium.

$$D = dr \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Substituting this value in equation 1, we have:

$$\frac{V}{q} = \frac{R\sqrt{ar}}{\sqrt{dr-d}} = \frac{R\sqrt{dr}}{\sqrt{d(r-1)}} = \frac{R\sqrt{r}}{\sqrt{r-1}}.$$

As the value R and r are constant and predetermined, it follows that the ratio of the fractional volume measured by the tally to the volume passed by the shunt is constant, so long as the ratio of pressure differential through the proportionate openings is maintained constant. The accuracy of the meter, therefore, depends upon three elements; the tally, freedom from obstruction of the parts or foreign matter and the elimination of friction in the parts of the shunt.

Sizes and Capacities of Wylie Proportional Station Meters.

Size of Connections Inches.	Height of Shunt Overall Inches.	Capacity Cubic Feet per Hour.
8	60	75,000
12	72¾	100,000
16	78½	180,000
24	....	500,000

The Westinghouse Proportional Meter is not recommended for manufactured gas. The 12-inch size is listed to pass 150,000 per hour, and larger sizes are made to order. It is smaller and more compact than the Wylie meter designed for station meter use.

Proportional meters should not be used where the flow of gas is pulsatory, as when connected near a positive exhauster. The connections to the inlet and outlet should be at least 5 or 6 feet of straight run of pipe, rather than elbows or bends, and when used as a station meter it is advisable to provide means for testing its accuracy, by connections arranged so that it can be run in tandem with a wet drum station meter.

Calorimetric Meters.—A calorimetric meter is one in which the gas is heated or cooled and its volume computed from the transfer of heat and the known specific heat of the gas. The Thomas electric gas meter is of this type. For a description of the apparatus and of the theory of its action, see the Report of the American Gas Institute of 1912.

Selection of a Meter.—This discussion of the limitations of meters for large quantities of gas may influence the choice of one for a particular purpose. Questions of confidence, convenience, accuracy and cost will have weight.

Confidence is subjective and may hardly be disputed. The most convenient device, the crudest Pitot tube, may, by accident, be correct under the conditions used; and it is claimed, and apparently proved, that a Pitot meter including a carefully prepared pipe, in a favorable position in a line, is correct within 2 per cent,, at favorable rates of flow, (over 25 linear feet per second. showing about 2/10 inch water pressure.) Twenty careful readings are made on two diameters of the pipe. Here convenience is somewhat sacrificed to accuracy; and one cannot believe it accurate unless he proves it.

All are more convenient and much less expensive than a wet meter.

The cost of large meters varies so widely that it is worth serious consideration whether an inferential meter may not sufficiently fulfil the requirements. It is a mark of progress in the industry that we are enabled to use one of several kinds in manufacturing and distribution. We give a table of the approximate preportional original costs for capacities of about 250 M per hour:

The cost of a 500 light diaphragm meter passing 5,500 feet per hour is about $27. Comparing the largest sized diaphragm meter and a 16 foot station meter the costs are as 1 to 33, and the capacities as 1 to 45.

Wet station meter	100
Rotary	50
Electric	38
Proportional	30
Venturi	12
Pitot	½

The standard conditions for measuring and declaring the volume of gas are in cubic feet at a barometric pressure of 30 in. and at 60 deg., and saturated with water vapor at this temperature. These conditions are, in practice, strictly followed only in a calorimetric test. In a photometric test the actual excess pressure on the meter is generally ignored, although if one is working without a governor on gas entering or leaving a high holder it is worth taking into account, for it may amount to over 3 per cent. In testing or comparing measuring devices, the conditions are seldom the standard ones on either meter, and all must be corrected to the common standard, to obtain any significant comparison; therefore, variation from atmospheric pressure is a factor.

In measuring gas as manufactured, where formerly we took the figures of the meter at random temperatures, perhaps at about 60 deg. at the season of the greatest make in winter and much higher in summer, we have progressed so that most companies correct for temperature, and some also correct for the barometer. Then comparisons may fairly be made between different localities. A few carry these refinements to a conclusion and correct for the pressure on the meter. This last may easily be significant enough to make a very satisfying increase in the figures of the daily results. At all events, it aids in a comparison of different times and places. There was an argument for correcting the temperature to 60 deg. that by so doing we were approching the temperature of the consumers' meters, and thus reducing the "unaccouuted for gas." Correcting for pressure at the meters would tend to increase this unaccounted for gas, but it would give us a truer view of operations. These remarks apply to displacement meters. The Thomas Calorimetric meter makes these corrections automatically, except in respect to the varying amount of water vapor in saturated gas at different temperatures. This error may be ignored; but it is compensated for by locating the temperature difference resistance coil in the gas main and by forming this coil of a material whose resistance decreases at the desired rate with an increase of temperature.

The velocity meters, Venturi, Pitot and Calibrated orifices, which must derive their results by calculation, or by calibration under fixed conditions, depend upon a knowledge of the temperature, pressure and specific gravity.

Tables of corrections for temperature and pressure can be found in the 1908 and 1913 Proceedings American Gas Institute. If it is desired to declare the amount of gas at any excess pressure it may be done by adding to the volume corrected for temperature and barometer, 1 per cent. for every 4 inches less than the meter pressure. Artificial gas, confined over water, is assumed to be saturated with vapor of water.

German Mantles via. Holland.

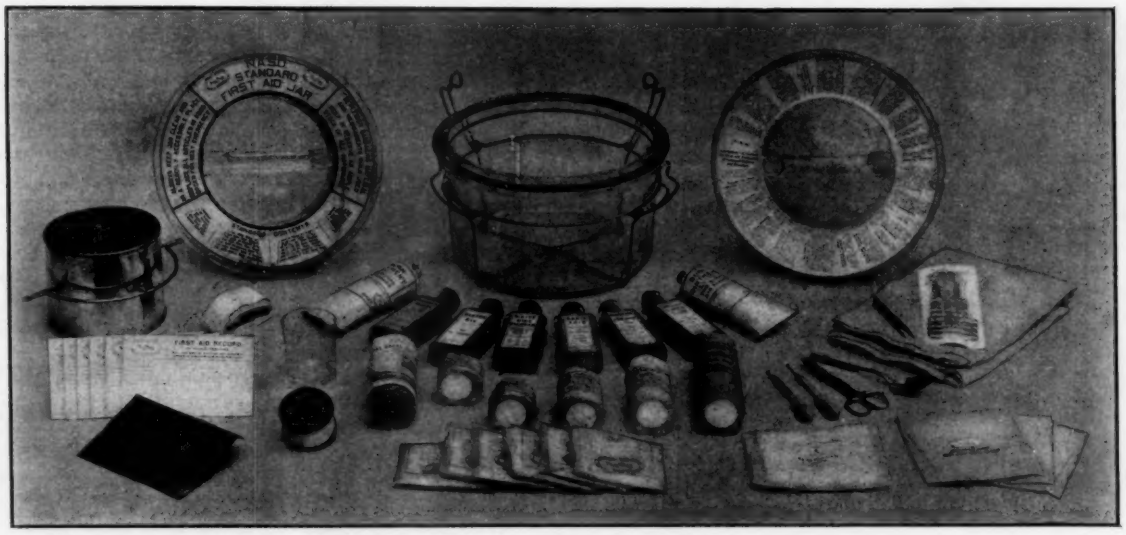
A correspondent in the "Gas World," London, complains that German mantles are reaching England through Holland. The record of mantles imported from Holland show:

Week ending	October	3	£ 257
"	"	10	790
"	"	17	634
"	"	24	677
"	"	31	455
"	November	7	672
"	"	14	999
"	"	21	1,086
"	"	28	1,009
"	December	5	1,827

The Auer Gasgluhlicht Company, of Berlin, are also writing to British gas companies stating that they can supply mantles through the neutral country of Switzerland, and asking that orders be addressed to the Auer Gasgluhlich Company at Zurich. They enclose with these letters a scandalous pamphlet, showing how England, and not Germany, is responsible for the war, and in generai saying all they can against the British nation.

THE N. A. S. O. STANDARD FIRST AID JAR.

By M. W. ALEXANDER.



N. A. S. O. STANDARD FIRST AID JAR AND CONTENTS.

(Illustration shows both sides of Jar Cover.)

1 Tourniquet.
1 pair Nickel-plated Scissors.
1 pair Nickel-plated Tweezers.
1 Triangular Sling
1 Wire Gauze Splint,
12 Assorted Safety Pins.

1 2-oz. bottle Castor Oil.
2 3-oz. tubes Burnt Ointment,
1 2-oz. bottle 3 per cent. Alcoholic Iodine.
1 2-oz bottle White Wine Vinegar
1 2-oz. bottle 4 per cent. Aqueous Boric Acid.
1 2-oz. bottle Aromatic Spirit of Ammnia.
1 2-oz. bottle Jamiaca Ginger (or substitute).

1 piece of Flannel 24 inches by 26 inches
1 roll Absorbent Cotton (1.5 oz.)
1 roll 3-inch by 10 yds. Gauze Bandage.
1 roll 2-inch by 10 yds. Gauze Bandage.
2 rolls 1-inch by 10 yds. Gauze Bandage.
1 Spool 1-inch by 5 yds. Adhesive Plaster.
6 packages 6-inch by 32-inch Sterile Gauze.

1 Teaspoon
1 Metal Cup
1 Medicine Glass.
2 Medicine Droppers.
3 Paper Drinking Cups,
First Aid Record Cards.

To train men in proper methods of first aid treatment of injured and sick persons, and not furnish proper materials for the work would be doing half a job only; to furnish the materials and not to provide for their convenient storage and ready accessibility would be doing the job in a slip-shod manner. It is therefore important that first aid materials for effective treatment of slight wounds, or for emergency treatment of serious injuries, should be furnished and kept in a suitable container in which they can be readily carried. Such first aid outfits, in one form or another, are now in quite general use in industrial establishments.

With some, wooden or tin boxes are used as receptacles for the materials, but wooded boxes are usually heavy and inconvenient to carry; tin boxes are lighter in weight but are easily dented and apt to rust. Both are open to the complaint that it is difficult to keep them clean and in good order. These outfits have the added disadvantage that their entire contents cannot be seen at a glance, and have to be disarranged to get at an article in the bottom of the box.

In order to provide more sanitary equipment, glass jars have come into use as containers for first aid materials. Their advantages over wooden or tin boxes are obvious. They can be easily kept clean and quick access can be had to all materials.

The N. A. S- O. Standard First Aid Jar was developed to meet the requirements of a compact, convenient, sanitary outfit. The jar itself is structurally strong and is made stronger by special annealing treatment. It has smooth surfaces and straight walls on the inside to promote cleanliness and facilitate the removal of the contents. In the glass cover a convenient carrying handle is molded and the cover is held on the jar by spring clips which are a part of a metal cage in which the jar sets; this metal cage affords added protection against breakage. A rubber gasket between the jar and the cover makes the outfit dust-proof, and equalizes strains on the cover. The jar is just high enough to accommodate the bottles of medicaments stored in it, so the stoppers cannot come out of the bottles when the cover is on the jar. Medicine bottles, bandages, absorbent cotton, burn ointment in collapsible tubes and a wire gauze splint are set along the wall of the jar so that they are plainly visible from the outside and can be quickly located. A metal dish placed in the inside of the jar, keeps these articles in their proper place. The metal dish is used as a receptacle for other parts of the outfit, such as tourniquet, medicine glass, gauze bandages, medicine droppers, spoon, scissors, etc.

The accompanying illustrations and list show that a surprisingly large number of articles are stored in the jar, which is only about 9½ inches in diameter, 6 inches high, and with contents weighs only slightly more than 12 pounds. Yet the jar includes every material, which a conference of physicians agreed upon as necessary for effective first aid treatment by laymen.

The Arrangement Allows the Quick Removal of Any Article Without Disturbing the Rest.

Even a splint is provided, a strip of flexible wire gauze 30 inches long and 4½ inches wide, wound into a small roll. This can be cut to the required length and shaped snugly around a broken limb; held in place by bandages this splint affords ample protection to the limb until a physician can set the fracture.

Although it is not contemplated to use water in first aid work, yet when necessary both the jar and the metal dish may be used as water vessels.

It is necessary to include in the first aid outfit suitable instructions for its use. If these are provided in a form of a book or leaflet, they might be lost. In order that these may always be at hand, they are printed on the inside of the cover of the jar; while on the outside is a list of the materials which should always be in the jar, also brief directions for the use and care of the outfit.

Some may want to place a jar on each truck or wagon used in connection with outside construction work. In this event, the jar should be kept in the padded shipping box, which is provided with an opening in the lid so that the whole can be carried by the handle of the jar. When desired, a lock may be attached to the box.

The arrangement of the N. A. S. O. Standard First Aid Jar warrants the claim that it is a compact, convenient, sanitary outfit. It is called the N. A. S. O. Jar because it has been standardized by the Conference Board of Safety and Sanitation of the National Affiliated Safety Organizations. These jars may be secured from the secretary of any of the associations comprising the conference board, viz:—The National Founders' Association, The National Association of Manufacturers, The National Metal Trades Association and The National Electric Light Association. They are sold at practically cost, as there is no intention to make a profit on any of the articles standardized by these associations.

German Association on Pressures.

The last meeting of the German Association of Gas and Water Engineers appointed a Pipe Committee, which has been investigating that subject from several aspects. The questions handled have been divided under four heads, as follows:

1. High pressure distribution. Leakage and other observations on mains; formulæ for transmission pressure, etc.
2. Cast-iron and wrought-iron or steel mains; their differences, experiences, strength and durability; behavior in movements of the soil.
3. External diameter of pipe; joining of cast-iron to wrought
4. Uniform signs and colors on plans for pipes and mains.

The sub-committee on these divisions have not arrived at final conclusions, but give brief reports of progress.

High Pressure Distribution.—The Mid-Rhenish Association of Engineers suggested that it would be interesting to consider whether it would be advantageous to increase customary distributing pressures by 4 to 8 inches water column.

The statement laid before the committee enumerated the advantages of such an increase of pressure as these:

(*a*) Reduced effect of fluctuations of pressure; greater capacity of distributing mains and services, and reduction of trouble from small or blocked pipes, or high resistance of meters.

(*b*) Increased efficiency in consumers' appliances; greater ease of control and less sensitiveness to fluctuations of pressure; wider applicability to industrial purposes.

Some of th e disadvantages that might be anticipated were:

(*a*) Increased leakage from the distributing system, loss of gas from broken pipes, greater water seal for gas meters. etc., leakage from cocks, sockets, stuffiing-boxes, etc.

(*b*) Smoking of consumers' burners.

The question might be divided as follows:

1. Does increased pressure present advantages for the consumer, and can ordinary appliances be generally used with increased pressure?
2. Will new industrial uses of gas be opened up by increased pressure?
3. Will a distribution system, on the whole, secure benefits from ncreased capacity of the mains, which are not out-weighed by attendant disadvantages?

The Committee thought it very important to settle the first question, as to the advantages to the consumer. In order to do this, inquires are sent out; and the Instructional and Experimental Works of the Association made investigations on the economy of ordinary appliances with increase of pressure. The points on which inquiry was made were as follows: (*a*) Have you made experiments on the output of gas to consumers at increased pressures of 4, 6, or 8 inches ofw ater? (*b*) What was the highest pressure tried? (*c*) What was the lowest pressure? (*d*) Was maximum pressure at the works or at a high part of the town? (*e*) Were the usual burners, cookers, etc., used, or what changes were made? (*f*) What was the result of your experiment. The questions were directed to seventy firms and gas companies—chiefly works in large towns, and works in which it was thought high-pressure distribution had been tried. Some 58 replies were received, of which 28 were informative.

These replies and experiments lead the Committee to conclude that probably no considerable advantages ensue to consumers who use gas only for lighting and cooking purposes, when the pressure is increased by 4 or 8 inches, unless burners specially designed for such pressures are adopted. It remains to be proved whether increase of pressure might not greatly stimulate the industrial use of gas; and this matter is being considered by the Committee. The experiments made at the Experimental Works with boiling rings showed that when the pressure was increased from $\frac{1}{16}$ to $\frac{32}{16}$, using the same kettle and the same nipple on the ring, the efficiency was reduced from 55.25 to 50.7 per cent., although the time required was considerably less. Altering the nipple to suit the increased pressure raised the efficiency to 56.2 per cent.; the time being nearly as long as at $\frac{1}{16}$ pressure. When a larger kettle was used with the original nipple, the efficiency was 55.1 per cent. With pressure of $\frac{52}{16}$, the efficiency with the original nipple and kettle was 47.5 per cent. By altering nipple this was increased to 53.5 per cent., and a change of the kettle, retaining the original nipple, gave efficiency of 56.9 per cent. The results showed that with any considerable increase of pressure it is necessary to change the nipples, and the construction of the boiling ring, or the size of the vessel used, in order to maintain or increase the efficiency.

Experiments on the effect of increased pressure on incandescent burners were made on three types of burner, the Windemüller, the Welsbach "C" upright, and the Graetzin. At $\frac{16}{16}$ pressure the Windemüller had a duty of 23.24 candles per cubic foot. At $\frac{32}{16}$ without adjustment of the regulating nipple, the duty fell to 12.79 candles per cubic foot; but upon adjusting the duty of 23.24 candles per cubic foot was recovered. Fluctuations of pressure igniting devices, caused a drop in duty. Under $\frac{52}{16}$ with the nipple adjusted for this pressure, a duty of 22.41 candles per cubic foot was shown; but the burner was noisy and very sensitive to slight fluctuations. Generally, the duty of this burner, is not affected when the pressure is increased to 4 inches; but an increase to 6 inches makes it practically unusable. The Welsbach "C" burner, on the other hand, has a duty of 16.89 candles per cubic foot at $\frac{16}{16}$; 18.1 candles per cubic foot, at $\frac{32}{16}$ with the nipple regulated; and at $\frac{63}{16}$ 18.90 candles per cubic foot. The Graetzin inverted burner showed a duty of 22.62 candles per cubic foot at $\frac{16}{16}$; 23.78 candles per cubic foot at $\frac{32}{16}$; at $\frac{52}{16}$ 23.35 candles per cubic foot; and at $\frac{72}{16}$ the duty fell to 22.31 candles per cubic foot. Thus, with careful regulation the inverted burner shows an increased duty up to 4 inches, but at higher pressure falls off.

Use of Cast and Wrought Iron Pipe.—This part of the investigation involved questions on which further information was necessary, and the committee addressed a series of questions to gas and water companies asking their experience. The questions covered behavior of cast iron pipe and wrought iron or steel pipe used for street mains and for services. The information asked was as to the lengths laid of each type, diameter, the time since laying, resistance to rusting and other chemical and physical effects, the relation of breaks to the material and sizes of the mains, the manner and cost of laying, and the method of making service connections. The immense volume of material received in reply to these questions led the committee to decide to confine the investigation in the first instance to the results of practical experience, excluding for the present any chemical and physical investigation.

Municipal Plant Need Not Necessarily be a Profitable Venture.

According to a decision of the Franklin County Common Pleas Court, at Columbus, O., a municipality may operate electric and other plants at a loss if it sees fit to do so, making up the resulting deficit from taxes. The case arose on an injunction brought by a taxpayer against the Mayor of Columbus attempting to restrain him from charging a rate for electricity from the city's plant which was alleged to be inadequate to meet the cost of operation. The court held that no ground for injunction was stated. The case will be carried to the Supreme Court and is being watched with considerable interest, especially by companies operating electric plants, which have frequently contended that municipal plants do not charge enough to pay the actual expenses of operation; and that the taxpayers as a whole carry the cost of lighting for a minority.

Publications.

This is a barrel of Dixon's Boiler Graphite, in the form of a mailing card, the Joseph Dixon Crucible Company of Jersey City is using to introduce this product to the attention of engineers and others interested in cleaner boilers. The card is printed in two colors, and on the inside calls attention to the fact that for nearly four score and ten years the company has had at its command all forms and grades of graphite, and, therefore, has no incentive to use or recommend other than the proper grade for boilers. "D. B. G" is said to reduce fuel consumption, prevent hardening of scale, give to the surface of the boilers a smooth polish, prevent pitting. and make the removal of scale possible by gentle mechanical action. The reverse fold of the card forms a return post card bearing a request for the Dixon booklet, "Graphite for the Boiler."

Vulcan Bulletin.—The spirit of Christmas is much in evidence in the December number of the "Vulcan Bulletin." This monthly reminder contains much that is of practical value and is useful in calling attention to the extensive line manufactured by the W. M. Crane Co. There are 1,000 uses for gas and they make appliances for 999 of them, judging from the literature.

Water Heaters.—A convincing circular of monumental proportions entitled "Building a Reputation," comes from the Pittsburgh Water Heater Co., showing the organization and the plant in action.

Bulletin Obituary.—The last number of the California Journal of Technology has been issued, and its obituary, which occupies considerable space, gives a number of reasons for its demise. Lack of funds, inability to obtain articles from students and nervous prostration of the several editors are among the reasons.

Business Depression.—The December "Safety News," says: "Abe Martin asks: 'What has become o' th' ole-fashioned family doctor with the long whiskers that allus wanted t' be cuttin' somebuddy's leg off?' "

Gauge Board.—A simple compact and effective gauge board made by Lloyds is illustrated in Catalog Supplement 901.

Coal Analysis.—The work of Mr. S. W. Parr (well-known to the gas fraternity) and Mr. H. F. Hadley on Analysis of Coal with Phenol as a Solvent is in Bulletin 76, issued by The Engineering Experiment Station of the University of Illinois.

Roofing.—Protected roofing for buildings of modern steel and concrete construction, known as Asbestosteel, is fully described and beautifully illustrated in Bulletin 54 of the Asbestos Protected Metal Co. The workmanship in the design and make up of the publication shows the labor of a master hand in Technical Advertising.

Valves.—Types of Mueller reducing and regulating valves are described and illustrated in Catalogue No. 5. They are made for water, steam, air and oil, as well as for gas.

Heating Appliances.—Radiators, Logs and Mantle-type Heaters designed to furnish heat "when you want it" are shown in colors in a catalogue issued by the Mead Gas Heater Company.

Household Gas-ette.—The Meriden (Conn.) Gas Light Company issues a monthly magazine for the progressive housekeeper. As the election in November did not effect the women Progressives we have no doubt that they will read and profit by the timely suggestions contained in this attractive little business builder.

Jet Regulator Cocks.—A poster of the Direct Jet Regulator made by the Johnson Gas Appliance Co., shows clearly how the regulation is obtained. It is attractive as well as convincing.

Chemistry.—Some data on the important subject of by-products are given in the December issue of the "Little Journal," published by Arthur D. Little Inc. As with others who have knowledge of the subject, Little says, that there is lots to be done if we are to increase our production of the things supplied by the nation's now at war.

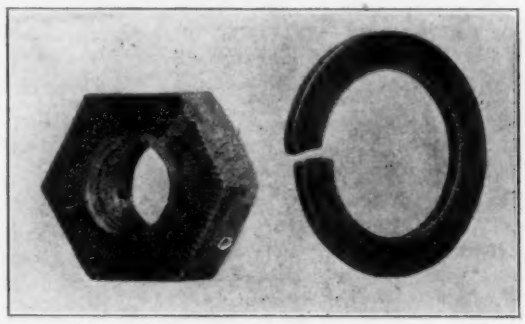
Insulating Material.—"Saving Fuel" is the title of a booklet giving practical suggestions on the use of Nonpariel Insulating Brick, made by the Armstrong Cork and Insulation Co. Among the installation of Nonpariel is a waste heat boiler of the United Gas Improvement Company. Insulation has a direct bearing on your "cost per thousand."

New Methods and Appliances.

ENGLISH PATENT FURNACE.—An English patent has recently been issued on gas heated furnaces used for hardening and melting metals, known commercially as lead or salt bath and crucible furnaces. It consists of a construction wherein the initial heat is generated in the upper part, and the products of combustion are conconducted around the crucible and to a point below the base of the pot to reach the flue. In one design the combustion chamber is in the upper part of the furnace, preferably where the heat can play immediately and directly upon the crucible at or near its upper end.

The crucible is supported on a stand of refractory material; but when a metal pot is used it is preferably supported by a flange or lip at its upper end resting upon a ledge in the top of the furnace, and in such a manner that a space is left all around the body, while the lower portion may rest on ledges of brickwork or on a refractory stand. The space communicates, through a central opening in the floor of the furnace, with a transverse passage or flue, with its floor inclined in one direction towards the side of the furnace, where means are provided for closing the opening. In the other direction the flue communicates with a chimney or flue pipe. The secondary air is admitted through openings at points just beneath the combustion chambers, or the air may pass into openings in the wall of the furnace at any other suitable point (or, if desired, near the base of the furnace) whence the air can be conducted through passages leading up to the combustion chambers—thus superheating the air. The air inlets have valves or other means for regulating the supply.

CORRUGATED NUT AND LOCK WASHER.—To increase the gripping power of the lock washer of the split and warped ring type, a Philadelphia company has brought out a lock nut with corrugated or ratchetted bearing surfaces. It is claimed that this surface is superior to the lock washer with upset ends, in that it guarantees a uniform bearing surface against the nut and backing. In the upset type the pressure is greatest at the ends and at 180° from the ends, while at points between it is considerably less. It is asserted that this uneven pressure causes vibration in the washer, a consequent crystallization of the steel and eventually fracture, which the even bearing surface prevents. This new nut washer is especially adaptable for severe usage, such as on automobiles, railroad equipment and machinery in general. The corrugations moreover give the washer the needed locking power, which the plain washer lacks.



Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,121,282. Gas Cock. F. R. Parker, Chicago, Ills.

1,121,416. Automatic Electric Gas Drip Alarm Device. C. H. Stevick, Astoria, N. Y.

1,121,462. Open Front Gas Heater. P. McK. Bradley, Joplin, Mo.

1,121,464. Gas Burner. W. L. Brooks, Ardmore, Okla.

1,121,516. Gas Generator. G. P. Luedke, Chatham, Ills.

1,121,691. Gas Stove. T. M. Tobias, Pittsburgh, Pa., assignor to Lawson Manufacturing Co., Homestead, Pa.

1,122,065-6. Artificial Lighting Means. E. J. Brady, Philadelphia, Pa., assignor to The United Gas Improvement Co., same place.

Items of Interest
FROM VARIOUS LOCALITIES.

AT the recent monthly meeting of the Mutual Advancement Association of the Union Light and Power Company, Fargo, N. Dak., 50 members were present. An innovation in the entertainment was the showing of four reels of motion pictures with the picture machine of the North Dakota Agricultural College. This institution has placed the machine at the disposal of the Employee's Association for its meetings. The pictures shown were of an educational nature.

MR. AUGUST G. VOGEL, for some time sales manager of the Meek Oven Company, will become associated with the General Gas Appliance Company and the Schmitt Mfg. Company. The field of the Meek Company has been greatly enlarged during Mr. Vogel's period with the company, and we look for further success in his new work.

THEY seem to have a poet in the office of the Athol (Mass.) Gas and Electric Company, though he modestly conceals his identity. His Athol boom cry: "Made in Athol isn't enough; buy in Athol that's the stuff!" is not the only versification that he has recently perpetrated. Couplets from his pen enumerating some of the things the company sells for Christmas gifts are used as ads. in the local paper.

THE Brown Instrument Company announce the removal of their office and works to Wayne Junction, Philadelphia. This company has greatly increased the capacity of its plant, due to increased demands for their goods. We wish them continued success and increasing prosperity in their new location.

A RECENT issue of a Provo, Utah, paper contained a column description of the Utah Valley Gas & Power Co. plant including a story of just what the gas was made from, and the province of each part of the plant machinery. This is a good way to popularize gas and extend its use.

THE Town Board of Southampton, L. I. (N. Y.), has granted a franchise to Henry F. Cook, representing the Sag Harbor Gas Company, "to install, acquire, lease, operate and maintain lines of pipe through the streets and public highways of the town of Southampton," for supplying gas.

HERE are a couple of "jingles" submitted to the Eau Claire (Wis.) Gas Light Company in a prize contest:

There was a man in our town
Whose name was Artie Choke,
His furnace made him weary,
His house was full of smoke;
But PURE GAS COKE relieved his care
His pocketbook and mind;
A happier man in all our town
It would be hard to find.

Blow, blow, thou wintry wind,
I do not give a rip;
My right-hand neighbor has the croup
And another has the grip.
But I sit here in keen delight
And enjoy my evening smoke;
For I took a tip from the GAS MAN
And I'm burning PURE GAS COKE.

THE plant, franchise and good will of the Saranac Lake (N. Y.) Gas Company will be offered at public sale on Saturday, January 9, by Receiver Chas. A, Gruber, who has been operating the plant for some 2 years or more.

THE Board of Directors of the Central Hudson Gas and Electric Company, at its monthly meeting in Newburgh, N. Y., on December 19th, authorized the distribution amongst its employees, of approximately $5,000, and the employees received it for Christmas. Although the past year has been a difficult one on account of the general industrial depression, the employees have helped to bring about greater efficiency in the operation of the property to off-set adverse conditions. The directors have taken this means of recognizing the excellent work of the employees in the company's behalf.

J. P. O'RIORDEN, of Charlestown, Mass., has brought suit against Charles Francis Adams, 2nd, Walter C. Baylies, Samuel Carr, James L. Richards, Joseph B. Russell, Frederick E. Snow, Charles E. Stone, Robert Winsor and C. Minot Weld, all of Boston or vicinity, and Robert C. Pruyn of Albany, N. Y., who are the original trustees in a declaration of trust, out of which the New England Gas and Coke Company was organized. Mr. O'Riorden is endeavoring to hold them personally liable for the debt he claims is due to his father. Patrick O'Riorden, in 1897, under an agreement made with Henry M. Whitney, sold 55½ acres of land in Everett, and upon this land the buildings and plant of the gas and coke company was established. The purchase price was $726,405.50, and $510,-556,55 has been paid in these installments: $100,000 in 1897; $334,281.35 July 8, 1898: $56,019.80, March 10, 1899, and $20,-255.40, Jan. 7, 1903. The balance $215,848.95, now alleged to be due, with interest to date added, brings the total amount due up to nearly $400,000.

THE Board of Directors of the Binghamton (N.Y.) Gas Works, at their last meeting, adopted appropriate resolutions expressing regret of the death of Colonel George W. Dunn, and elected C. W. Bennett, Secretary and General Manager of the company, to fill the vacancy on the Board caused by Col. Dunn's death.

MAYOR ELLIS, of Grand Rapids, Mich., has issued an ultimatum (in a stump speech) to the Grand Rapids Gas Company, declaring that he will allow 30 days for the gas company officials to signify a willingness to sell at an inventoried price at the expiration of its present franchise, or submit new franchise terms. Failing that, the question of establishing a competing municipal plant will be put up to the voters.

"N, W.," WRITING from Lynn, Mass., says: "You can imagine the rush there was about the Christmas tree of the Lynn Gas and Electric Company the afternoon before Christmas when the gifts were distributed to the children. We do not know of a public service corporation in this State that does more generous publicity work than the local one, and a great part of it is of the public-spirited kind that does not always bring direct results except in the self consciousness of aiding in movements that interest and benefit the people.

MR. HENRY M. WALLACE, of Detroit, Mich., President of the Temple (Tex.) Gas Light Company, and of a corporation owning gas plants at Corpus Christi and Waxahachie, is inspecting the Texas plants and arranging for extensive additions and improvements. While in Texas, Mr. Wallace will investigate the natural gas field at Mexia and other places in Limestone County with the end in view of constructing a pipe line to Temple. He is also committed to the proposition of prospecting the territory immediately surrounding Temple with an idea of discovering another gas field.

THAT conditions as well as business are improving at the Richmond, Va., municipal gas plant is indicated by the November report to the Administrative Board, submitted by Superintendent Knowles. According to the report of the Superintendent the receipts for November were $44,353.60: $961,46 more than the corresponding time last year. It also was an increase of $4,000—all but 9 cents—over last month. The number of complaints received during the month was 1,315. Of these 844 were at the main office and 471 at the upper gas works. The number of complaints last month was 4,065; showing a falling off of 2,750. "The weather is becoming settled and we are getting things to running right," said Superintendent Knowles.

MAYOR RIGGINS, of Waco, Tex., has vetoed the ordinances recently passed by the commissioners granting a franchise to distribute natural gas in Waco to the Texas Power and Light Company, the local gas and electric light company. The Mayor favored the proposition of C. T. Herring of Amarillo, who owns large interests in the Mexia field, but the commissioners and Mr. Herring could not come to an agreement and a franchise was granted to the local company. The commissioners signified a willingness to grant a franchise to Mr. Herring also, but the preliminary requirements of the applicant were not complied with and, when the franchise was granted the local company, Mr. Herring withdrew. The commissioners voted unanimously for the franchise and it is expected to be passed over the veto.

THE annual meeting of the Lincoln Gas and Electric Light Company will be held at its office in Lincoln, Neb., to-day. Proxies

are in the name of Frank W. Frueauff, George A. Montgomery and O. R. Mallat.

A CORRESPONDENT writes us that an interesting demonstration of an automatic gas cooker was given last week in the office building of the New Haven Gas Company under the auspices of the New Haven Women's Club. Perhaps the most popular feature of the occasion was the dinner served at 4:15 o'clock from the oven of a gas stove in which nearly all the viands had been placed at 2 o'clock, and which came out deliciously cooked when the lecture of the demonstrator had come to a close. While the other attractions held the close attention of the 125 club members present, they were naturally anxious to see the result of the cookery of the Sentinel automatic gas stove. The roast beef, browned potatoes, creamed pea soup, boiled turnips and rice pudding were done to a turn; just as nicely as the most exacting epicure could expect. The viands were served to those in attendance, who were lavish in their praise of the work of the stove. As said before, all that a housewife needs to do is to place the dinner in the stove at 8 or 9 o'clock in the morning, turn on the gas, set the automatic mechanism at the time which is required for the cooking, dress, go down town and stay there until evening, should she so desire. Should she not come home to dinner, all that it is necessary for the family to do is to take the food out of the oven, place it on the table and sit down to a warm meal.

THE New Jersey Northern Gas Company has put in a bid for the entire street lighting of Flemington, N. J., which is now divided between gas and electric. Their price is $30 per lamp per year on a five year contract.

ON the Cresent alleys in Wilmington, Del., the Gas Co. team defeated the A. O. U. W. bowlers, 2,484 to 2,344 pins. Shawback was high single with 223 pins to his credit. The score:

Gas Co. Team.

Wallace 174	189	184—	547
Brown 163	171	138—	472
Pipino 122	144	145—	411
Shawback 223	167	149—	539
Carson 156	188	171—	515
Totals.....838	859	787—	2484

A. O. U. W. Team.

Lenderman.....122	145	119—	386
Ball 173	133	162—	468
McCall 198	148	151—	497
Windish.....128	188	157—	473
Doelzer.....184	176	160—	520
Totals.....805	790	749—	2344

AT the last State election in Colorado an amendment was voted on which declared newspapers public utilities; that the newspaper business is a public service and affected with a public interest, and each newspaper, including its rates for subscriptions and advertising, be subject to all the laws of the State relating to the regulation or control of public utilities. The vote for the proposition was 35,752; against it, 91,426.

THE population of Denver, Col., is estimated to have increased by over 12,000 in 1914. The Denver Gas and Electric Light Co,, has 2,000 more meters in service now than at this time in 1913.

C. H. PATTON, head of the Cleveland, O., fire inspection bureau, urges that there be established a gas code, regulating the size of mains and pressure, along the same lines as the building and electrical codes. Investigation of gas franchises given the East Ohio Company show no maximum or minimum is put on pressure within the city limits. "High pressure lines, carrying more than 40 or 50 pounds, should not be permitted in Cleveland streets. All reducing stations should be outside the city. The menace from high pressure is too great."

EMPLOYES of the Grand Rapids, Mich., Gas Light Company had extra money for their Christmas shopping through the regular quarterly dividend to employes falling due December 21st. About $4,500 was distributed among 225 employes.

Utilities Commission News.

BUREAU OF STANDARDS TO DETERMINE.—The Public Service Commission of Maryland and the Consolidated Gas, Electric Light and Power Company of Baltimore have united in a letter to Dr. S. W. Stratton, director of the Bureau of Standards, asking that an investigation be made to determine what was the quality of gas given consumers in Baltimore prior to the rate reduction and what since then.

This is done because of the divergence in the commission's and the company's tests of the quality of gas. Prior to the rate reduction, which went into effect July 1, 1913, the gas had an average heating power of 675, according to the commission's test, and of 625 according to the company's. It has been found impossible to reconcile the two.

When the Bureau of Standards makes its report, the commission will take up finally the question of fixing gas standards for Baltimore.

PRICE FOR SERVICES.—The New Jersey Board of Public Utility Commissioner has reduced the $15 charge for service installations made by the the New Jersey Gas Co., of Glassboro. Until about a year ago the company ran services free, but has since been making a uniform charge of $15. The Board, in their notice to the gas company, declared the rate to be excessive and unreasonable. It directs hereafter that the charge be based on a flat rate of $4.50 for tapping the main with fifteen cents a foot for installing pipe from the curb line to the house.

RATE NOT EXORBITANT; BUT REDUCE.—The Illinois Commission has decided that the price the Central Illinois Public Service Company is now charging for gas in Charleston, Ills., is not exorbitant. A lower rate has been ordered, however, because the company admits that it may be able to sell more gas and thus make up the deficiency. The rate is reduced from $1.50 to $1.35 gross, or $1.25 net. The Commission says;

"It is a matter of very serious doubt whether or not a gas utility in Charleston, under the present conditions of population, can ever pay a substantial return on the capital invested therein, because any reasonable rate of service, even a high one that some few residents might conclude to pay rather than be debarred from using gas, could hardly be supposed to be sufficient to cover fully the indirect charges of operation (inseparable from all small plants), operating and depreciation charges, and to pay a reasonable rate of return to the stockholders."

FOR TEXAS UTILITY COMMISSION.—A bill has been drafted for submission to the Texas legislature creating a public utilities and corporation commission of three members. The measure puts all private and municipal public service plants under control of the commission, to which is also given authority to inquire into the business of all corporations of whatever character.

BOSTON REDUCTION REFUSED.—The Massachusetts Board of Gas and Electric Light Commissioners has dismissed the petition which sought to compel the Boston Consolidated Gas Co. to reduce its price below 80 cents. The Board finds that the company is operating under a sliding scale and that its price cannot be affected until 1916.

BUFFALO CASE CLOSED.—The New York Commission, in accordance with the previously announced approval of Mayor Fuhrmann, of Buffalo, has closed the city's case against the Buffalo Gas Co. The company is in the hands of a receiver and Mayor Fuhrmann has informed the Commission that its rates will be lowered as soon as re-organization is effected.

NOT ACTIVE COMPETITION.—The New York Commission, Second District, has granted approval of the franchise of the Mechanicsville Electric Light & Gas Co., from the town of Schaghticoke, Rensselaer County, and permits the exercise thereof under a contract with the town for lighting Hemstreet Park and the eastern portion of the bridge from Mechanicsville, despite the objections of the Half Moon Light, Heat & Power Co., which was already furnishing current to private consumers in the town.

The Half Moon Company objected on the grounds that it should be protected from competition, under the terms of the Public Service Commissions law, but in an opinion by Commissioner Emmet the commission finds that the intent of this part of the law was towards actual and dangerous competition. and not the theoretical or harmless competition found in the present case.

Financial Notes.

THE combined net earnings available for dividends of the subsidiary companies of the MASSACHUSETTS GAS COMPANY for November were $244,510, or $13,316 larger than those for the same month last year. Following are the November earnings in detail, with comparisons:

Gas Dept.:	1914	1913	1912
Boston	$136,976	$119,804	$158,573
Newton	6,301	5,032	7,592
East Boston	5,947	4,562	8,680
Quincy	2,464	714	2,392
Totals	151,688	130,112	177,237
Coal Dept.:			
Boston Tow Boat	5,483	698	6,272
Federal Coal	9,272	7,221	2,352
New England Gas	51,085	63,927	64,568
New England Coal	26,980	29,233	13,064
Totals	92,822	101,082	86.256
Grand Totals	244,510	231,194	263,493

THE SOUTHERN GAS AND ELECTRIC COMPANY is earning more than twice its bond interest, and two sinking fund payments of $75,000 each have been made against the outstanding $2,430,000 of refunding bonds. These bonds are secured by first lien on much of the corporation's property, and are junior to $865.000 of bonds on two plants.

THE STANDARD GAS AND ELECTRIC COMPANY, through the Philadelphia Trust, Safe Deposit and Insurance Company, is asking for tenders of sufficient of its convertible sinking fund 6 per cent. bonds due December 1, 1926, at not exceeding 105 and interest to exhaust the sum of $52,371 in the sinking fund. Tenders will be received until January 5.

BOSTON CONSOLIDATED GAS COMPANY has declared the regular quarterly dividend of 2 per cent. payable December 31 to stock of record December 29.

OFFICIALS of the FEDERAL LIGHT AND TRACTION COMPANY find cause for optimism in the settlement of the Colorado coal strike, and prior to that in the favorable settlement at the rate controversy at Tucson, Ariz. The Trinidad Electric Transmission Railway and Gas Company, the operating subsidiary in Colorado, felt the good effect in its November earnings, the net being $10,379, compared with $7,844 last year.

EARNINGS of the PEOPLES GAS LIGHT AND COKE COMPANY for the year ending with the current month, are expected to show a moderate increase over the figures of the previous year. This means that the larger dividend requirements have been met with a small surplus besides. The company is said to be in a strong financial position and the 8 per cent. dividend rate is intact.

WELSBACH COMPANY has declared the regular semi-annual dividend of 3½ per cent. on the preferred stock, payable December 31 to stock of record December 24.

A PLAN for the reorganization of the KANSAS NATURAL GAS COMPANY has been agreed upon by the United Gas Improvement Company, and various other interests in the company. The plan includes the reduction of the stock to $6,000,000 and all bonds will be reduced to actual costs paid therefor. Pressing obligations will be extended pending the completion of the reorganization. The receivers will remain in control and the entire affairs of the company, including the plan and the elimination of the water in the capitalization will be presented to the Kansas Utilities Commission.

THE OLD COLONY GAS COMPANY has declared regular quarterly dividend of 1¼ per cent. on the preferred stock payable January 1, to stock of record December 18.

The report of the UNITED GAS & ELECTRIC CORPORATION for the 10 months ended October 31, shows gross earnings $23,873,414; operating expenses, maintenance and taxes, $13,931,401, and net earnings $9,942,013. Fixed charges called for $5,781,321 and the balance applicable to renewals and dividends was $4,160,691. The gross earnings gained $557,243, operating expenses increased $289,-212 and net earnings were $268,031 better. One reason for the comparatively small increase in gross is that the railways operating departments showed a gross increase of less than 1 per cent., while the gas and electric department gained more than 6 per cent. As is the case with all the other public utility corporations that use large quantities of coal and oil, the new contracts made for 1915 will show a very considerable saving. The parent company controls four sub-companies—the United Gas & Electric, the American Cities International Traction, the Lancaster County (Pa.) Railway & Light Co., and 23 operating properties in 20 municipalities in the north, middle eastern and south central portions of the country, serving a population of over 2,200,000. These properties—electric traction, gas and electric lighting—have a total of 1,171 miles of track, carry around 330,000,000 passengers in a year, operate over 50,000,000 car miles, have nearly 82,000 electric meters and approximately 150,000 gas meters. The capitalization totals $207,419,000, made up of $117,989,000 bonds and notes; $23,234,950 preferred stock outstanding, and common stocks of $66,195,500. The corporation enters upon the new year with practically all financing of subsidiaries completed.

CONTENTS.

AN ASTERISK (*) DENOTES AN ILLUSTRATED ARTICLE.

WRITING TECHNICAL ARTICLES, by Mr. H. Thurston Owens 1
CONTRACTS FOR STREET LIGHTING 2
REPORT OF INDUSTRIAL FUEL COMMITTEE, NATIONAL COMMERCIAL GAS ASSOCIATION, by Henry O. Loebell 3
*THE MEASUREMENT OF GAS IN LARGE VOLUMES, by Dr. J. F. Wing 4
EDITORIALS 8
Prosperous 1915—Write More and Honor More—Industrial Fuel Data—Committee on School Lighting—Announcement.
OFFICIAL NOTICES—
Wisconsin Gas Association 9
New England Association of Gas Engineers 9
GERMAN MANTLES VIA. HOLLAND 10
*THE N. A. S. O. STANDARD FIRST AID JAR, by M. W. Alexander 11
GERMAN ASSOCIATION ON PRESSURES 12
MUNICIPAL PLANT NEED NOT NECESSARILY BE A PROFITABLE VENTURE 12
Publications 13
NEW METHODS AND APPLIANCES 13
English Patent Furnace—*Corrugated Nut and Lock Washer.
Recent Patent Issues 13
ITEMS OF INTEREST FROM VARIOUS LOCALITIES 14
Fargo Employee's Association—Mr. Vogel Changes—A New-England Poet - Brown Instrument Co.'s New Factory—Describes Plant—Coke Jingles—Saranac Lake, N. Y., Sale—Central Hudson Christmas Present—Sues on Old Transfer—Col. Dunn Succeeded by Mr. C. W. Bennett—Grand Rapids, Mich., Ultimatum—Lynn, Mass., Christmas Tree—Mr. Wallace in Texas—Richmond, Va., Business—Natural Gas for Waco?—Proxies for Lincoln, Neb., Meeting—Demonstrating Automatic Cooker—Flemington, N. J., Street Lighting—Wilmington, Del., Bowling—Newspaper Utilities—Wants to Limit Pressures—And Other Items.
UTILITIES COMMISSION NEWS 15
Financial Notes 16
Public Lighting Table for January, 1915 (Advertising Section) 12
Meeting Times of the Various Gas Associations (Advertising Section) 22